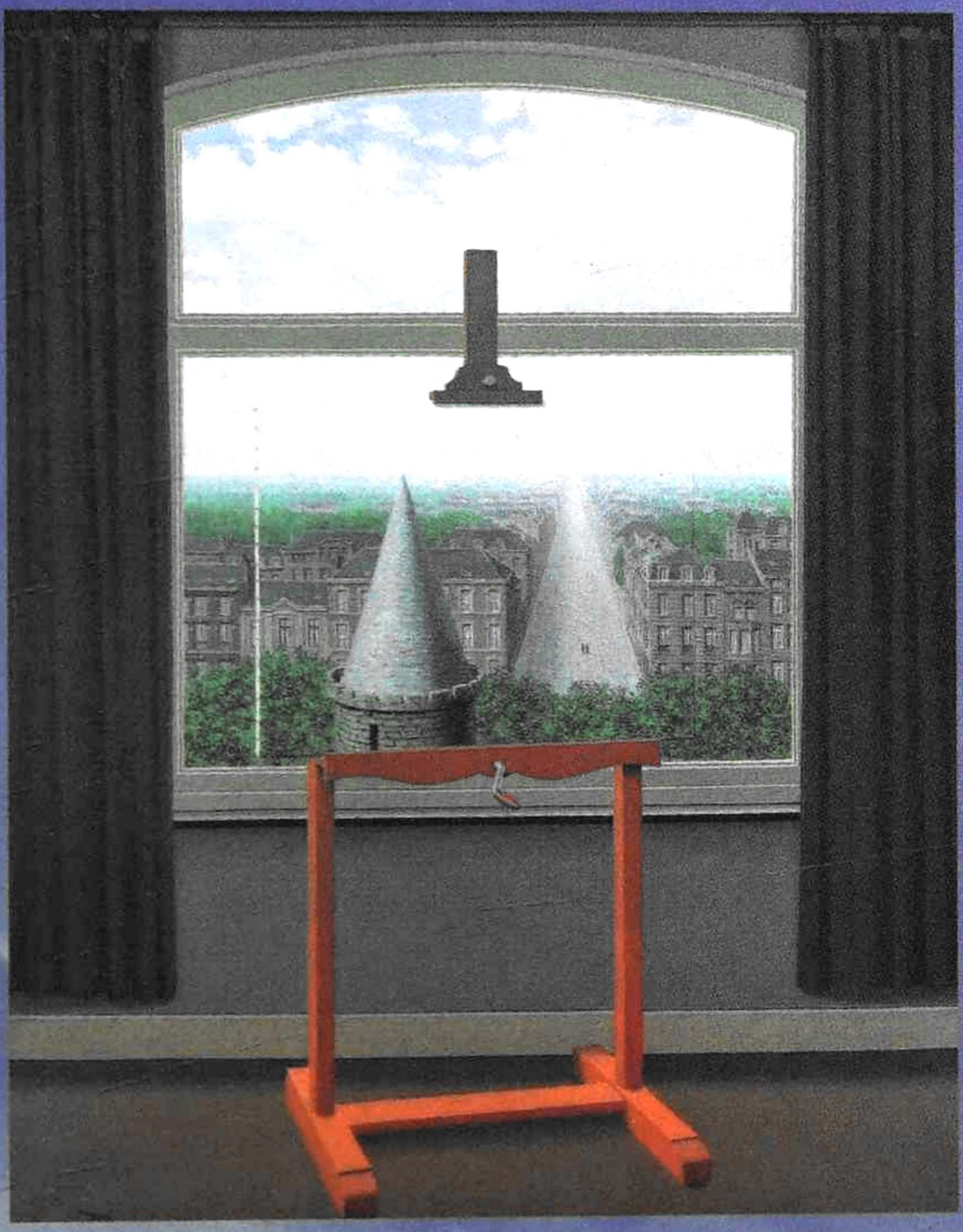
Heinz von Foerster

Bernhard Poerksen



Understanding Systems

Conversations on Epistemology and Ethics

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Volume 17

Understanding Systems

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Understanding Systems

Heinz von Foerster/Bernhard Poerksen

Conversations on Epistemology and Ethics

Translation by Karen Leube

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To Mai and Julia

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Preface

Many who have heard Heinz von Foerster speak or perform some other public function have had the feeling that there was something of a magician about him. Later they may have discovered that they were right. Midway through his teens, during a summer holiday he and his cousin Martin found the twenty volumes of Johann Christian Wiegleb's compendium of the magician's art in a small rural antique store. They managed to buy it, and a few years later they both passed the master's exam of the international magicians' guild. It made them professionals. But this is only one facet of Heinz' magic.

I have never seen Heinz perform the kind of things professional magicians show on the stage, but I have often witnessed the magic he is able to wield when the mood threatens to turn nasty at a meeting or speakers become belligerent at a symposium. Maybe he says something that changes attitudes, maybe he ostentatiously moves to another chair on the stage, causing an interruption. It's not at all obvious that it is he who is saving the situation, but I have seen it often enough to believe it is.

As a professional magician, Heinz created miracles for others, and this gave him sensitivity and respect for miracles in general. He realized that if you were persistent enough and followed any thoroughly rational path to its end, you came to face the inexplicable. Why should my pen fall when I let go of it? Gravity, you say? But *gravity*, as Gregory Bateson told his daughter, is just an explanatory principle, and as such it serves to cover up something inexplicable, a miracle. And when physicists assure you that the world began with a Big Bang, isn't that simply invoking a miracle?

The dialog presented in this book covers many of the topics that have occupied Heinz' mind off and on for at least seventy-five years. They are part of intellectual domains called epistemology, commu-

nication, human ecology, and ethics, domains that are all too often disregarded by working scientists. The form of the dialog helps to make accessible some of the toughest old problems we are facing, and the ideas that Heinz lays out point to ways of thinking that hold the promise of achievable accommodations.

Ernst von Glasersfeld
Amherst, Aug. 2001

A Foreword in Three Acts

I. Invention

If there were no such thing as a lie, everything that we say would be true. But with Ockham's semantic razor, we do not have to mention anything that is universally valid. That means truth does not come about until the liar has started doing his or her job. "Truth is the invention of a liar."

I was quite proud of myself for coming up with this insight and rushed over to a philosopher friend of mine so he could share in my discovery. "My dear Heinz," he said, "you're half a millennium too late!" and told me to read Nicholas of Cusa.

"Why him?" I wanted to know.

And so I learned that in God's infinite kingdom there are no lies. Everything is true. But everything is true because there are no lies. In order to make this easier to understand, Nicholas of Cusa provides us with a metaphor. Imagine a circle with a finite diameter and allow the circle to grow and grow and grow until the diameter becomes infinitely large. Then the circumference becomes a straight line. An infinite circle is identical to a straight line! The opposites coincide with each other. It's the *coincidentia oppositorum.*

II. Magic

In the spring of 1994, I was invited to hold the opening lecture at the fourteenth international conference on social psychiatry in Hamburg. I asked myself, "What can I tell the experts on social psychiatry that they don't already know? How can I get a foot in the door of this world?"

Luckily, the topic of the conference had already supplied me with the key to my lecture. It was entitled "Farewell to Babylon" and dealt with deterioration and confusion in language.

But what is language? How does language become a medication – the only medication – in the framework of a social psychiatry?

In my lecture, I tried to point people in the right direction. "Think about what takes place when we speak. It's impossible to understand how it works. As I stand here, you can hear me emit some grunts and hisses by pumping air through my vocal cords. And after a few minutes, some of you will nod your heads and find my grunts and hisses interesting, while others of you will shake your heads and say that everything is utter nonsense."

I then proceeded to say that we don't have the faintest idea about what is happening and for that reason I called my lecture "The Magic of Language and the Language of Magic".

III. Conversation

An international conference on social psychiatry that brings together 3,000 participants from all over the world attracts the attention of the press. The keynote speaker is likely to be the source of information about the majority of the topics of the conference. So it was no surprise that the Hamburg *Sonntagsblatt* sent a young man to my hotel to whom I was supposed to give an interview during my breakfast.

I tend to dread such occasions, because the questions usually don't have much to do with what the conference is dealing with. And when you read your "own" answers the next day, they have even less to do with what you have said.

To my amazement, however, the interview quickly turned into a conversation – thanks to my interviewer.

How did this come about?

It was simple. It resulted from the fact that the interviewer chose not to vest me with authority but instead decided to test out my attitude. Rather than writing down what I said, he questioned it. Fantastic! We were soon submerged in a fruitful conversation and it became clear that this exchange at the breakfast table was just the first step towards a bigger discussion.

One month later I was able to read Bernhard Poerksen and Heinz von Foerster's discussion entitled "I'm trying to dance with the world" in the *Sonntagsblatt*. It included thoughtful illustrations by M.C. Escher.

When Carl-Auer-Systeme publishers in Heidelberg proposed that we continue our conversations at my home on Rattlesnake Hill in Pescadero, California, I was absolutely delighted. We were kissed by the spectacular California weather and sat on our patio for more than half of the month of June of 1997 and talked and talked and talked.

Read it and see for yourself!

Heinz von Foerster
Rattlesnake Hill, January 1998

I. Images of Reality

1. Biology of Perception

The representation of the world

Bernhard Poerksen (B. P.) People generally believe that perception is a representation of reality. It is said that the knowing consciousness reflects what is outside. You describe the perception of the world in a completely different way, speaking about "constructing" and "inventing" reality.

Heinz von Foerster (H. F.) Well, a number of the ideas that I put forth are not all that new. More than 150 years ago, the great German physiologist Johannes Müller had already formulated a fascinating observation that he called the "principle of specific nerve energies". That must have confounded all of the representation theorists.

B. P. What did Johannes Müller observe?

H. F. He discovered that the nerves of the different sense organs responded to different kinds of stimuli such as light, sound, and pressure in their own specific way. And this happens *independent* of the physical nature of the stimulus that triggers off the sensation.

B. P. So our senses don't pass on authentic replicas of reality?

H. F. Exactly. We can never know what it is that stimulates them. We can only know what our senses conjure up in us from these sensations. At the gates of knowledge the supposed messengers of the world will be stripped of their particular characteristics. Today

we would also have to touch on the undifferentiated coding of stimuli. The only thing we know for sure is that there is a stimulus or a perturbation. That is the only thing that a nerve cell communicates. The cause for the perturbation is unclear, however. It is not specifically coded. For example, you could excite the fibers of the optic nerve with a drop of vinegar, and would most likely perceive a colored spot of light. Or you could use an electrode to stimulate a taste bud with a few volts, and you may have a sensation of the taste of vinegar. With these observations in mind, and they can be found in any textbook on the essentials of physiology, it is absolutely grotesque and downright stupid to talk about a representation of the outer world in the inner world. Vinegar turns into a splotch of color and electricity turns into vinegar!

B. P. What do you mean by outside, then? If I continue with this train of thought, one could say the following: We do not know whether or not perceptions and sensations exist independent of ourselves. It is impossible to decide whether there are colors and smells, pain, heat or cold outside in the world.

H. F. You see, what is happening here is nothing short of a miracle. Everything is alive. Music is playing, you can see colors, feel heat and cold, smell flowers or fumes, and experience a wide variety of sensations. Yet all of these are constructed relations. They do not come from outside but rather evolve from within. You could explain it this way: The physical reason for someone to be able to listen to music is the fact that a few molecules in the air burst on the eardrum a bit slowly and others a bit more quickly. That's what we then refer to as music. The perception of color starts in the retina. Individual groups of cells compute, you could say, the sensation of the color. What manages to penetrate inside from the outer world is electromagnetic waves that trigger a stimulus on the retina, and if there are certain configurations they lead to the perception of color.

B. P. And yet we experience the world as one that is fragrant, and bursting with colors and sounds. That is quite strange if you consider the fact that, as you see it, our senses only actually transmit the indistinguishable gray of the quantity of stimuli. That leads to the question as to how this world, with its abundance of nuances

and its particular quality, can evolve from this unspecifically coded quantity in the organism.

H. F. This question can be answered to some extent by taking another look at the work of Johannes Müller. A cell is a specialist for certain sensations and experiences that are sometimes quite different from each other. If these many different cells, these sensory end organs, are excited, these stimuli are correlated with each other in the nervous system, and as a result, an abundance of sensations and perceptions emerge. One thing that is very important: This immense abundance of experiences is already built in to some extent. It has nothing to do with the stimulus that excites the cells.

B. P. If I try to follow the path of our discussion, at this point we are getting away from the idea of external stimuli and what is outside us, and we are looking at the inner world of the organism and into a diffuse area of neuronal relations and connections. What actually happens inside? How can you describe this process more exactly?

H. F. Once you have understood that the qualities of the impressions of the senses are not coded in the receptory device, which is what Johannes Müller's fascinating views demonstrate, you come to the conclusion that these qualities must evolve in the central nervous system. That is where they are computed, as I prefer to put it.

We never see the same thing

B. P. What does the term "computing" mean in this context? It usually conjures up images of numbers, data, tables, and perhaps even a parallel notion of computer and spirit, although this is more a metaphorical association.

H. F. No, no, that would be completely incorrect. In my work, the notion of computing has nothing to do with numerical phenomena. Let's have a closer look at the word "to compute". It comes from the Latin word *computare*, which means that things are brought together in a relationship. *Com* stands for "together" and *putare* means "contemplate, consider". My use of the term computing is in this very general sense. There are several stimuli and impressions that have entered the inside of the person and are brought together in a rela-

tionship. And for me, that means that the processes in the nervous system should be understood as a process of computing.

B. P. How can this process of perception be described? What does "knowing" mean?

H. F. Knowing means that within the nervous system, relationships between different sensations are created. For example: You see something and this thing walks around, has six legs and has wings. And this thing buzzes and makes a noise. It stings you and causes pain. What is it called? The knowledge of what is going on is the result of the reciprocal effect of these different sensations and perceptions. You correlate the pain of a sting, your experience of what you have seen and heard, and you then say to another person, "I've just been stung by a hornet!" And since this other person lives in a social network and has also had this experience of the sting and the pain, he can understand and imagine what I am talking about despite the fact that he may have only been stung by a bee rather than a hornet. This is how ideas of reality are created that we can then talk about.

B. P. I'm afraid that I still do not exactly understand this process of "knowing". At some point, the process of correlating different perceptions that are within oneself must come to a close in order to allow a final impression to emerge. Something like, "Enough already, that's a hornet!"

H. F. The way I see it, knowledge doesn't reach some sort of final endpoint. No, it involves an endless and constant circularity. Just as I have begun to know something I start to know it all over again. You might describe my idea of knowledge as "processology". One's entire sensomotoricity, the muscles and the senses, continuously produce a reciprocal response and as this takes place, objects are created.

B. P. But there must be at least some preliminary results of the knowledge process, since I experience the objects that I perceive as being constant. Contrary to what your "processology" suggests, they aren't actually in a state of continuous change.

H. F. Yes, they are. The thing that we refer to as an object is changing all the time. You never perceive exactly the same object, exactly the same glass, and exactly the same cube. Even when you look in the mirror when you get up in the morning you always see a different Bernhard Poerksen.

B. P. All right, but so far I have always recognized myself. The objects and faces by their very nature have characteristics that create this impression of constancy and stability – that is the consequence.

H. F. You are quite right when you say that you see yourself in the mirror in the morning. And you become convinced that it is you that you see in front of you. And I have emphasized the fact that whatever can be seen in this mirror is never the same thing. You never see the same picture in this world that is continuously changing. How can this impression of stability be explained against the background of this continuous change? From the mathematical point of view, you can see this phenomenon as the computing of invariants, as the computing of constancy and stable values in a process of continuous transformation.

B. P. Could you use an example to illustrate this point?

H. F. Take a cube and look at its edges and surfaces. How is it possible to compute the invariants of the cube? The answer is, by moving and using the change in perspective that arises from the change in position. By moving your head back and forth, by turning the cube in your hand, you create new connections between the motor and sensory activity, and the nervous system begins to compute the invariants. It is important to understand that when we talk about this computing process we are talking about a competency. I think that what we refer to as an object is in fact a competency of our nervous system that enables us to compute invariants. That which we normally designate as an object is in fact a symbol of our ability to compute invariants.

B. P. Referring to our competency allows us to justify stable impressions and perceptions without having to refer to an external order that is represented in the organism.

H. F. Precisely. I'd like to return to the notion of computing that I use in this context. The German word for computing is *"errechnen"*. It contains the magical prefix *"er-"*, and this prefix always refers to active processes and to a moment of creation. Something is created that does not have to have previously existed. When I speak German, and I say that reality is *"er-funden"* [invented], *"er-rechnet"* [computed], and *"er-kannt"* [known], I am not talking about a passive reproduction of something that already exists, but rather always about processes that are creative and alive. Something is created (*"erzeugt"*) and invented (*"erfunden"*) – and not found (*"gefunden"*) and not discovered (*"entdeckt"*).

B. P. Is that right? There must be some kind of connection between the real world and the perceived world. If we return to the example of the perception of color, for example, of course it is right that the color red is not the characteristic of an object but rather the impression that comes about in the eye of the beholder. But on the other hand, the object must have a particular structure that is responsible for the fact that makes one aware of this red as a color.

H. F. I would turn the argument around. There is an object that appears to us to be red. Now the question arises as to how the impression of this color can be explained. What hypotheses can be identified? There are people who tell me that in the world around us, objects exist that are painted red, and that it is the fact that the things are painted red that triggers off my perception. I of course have to respond by asking, "How do we know that the objects are red?" They then answer, "Well, that's obvious. We see them." This means that they deduce from what they see what they assume to be outside them. That is the way their thinking process works.

B. P. It's my impression that you are placing far too much emphasis on the one who knows, or as neurobiologist Humberto Maturana would put it, the observer. To exaggerate the point, you make the observer and his or her cognitive autonomy absolute, and in so doing, you overlook and forget the characteristics of the objects in the world. What I mean is that the particular structure of the objects that we perceive as being red need to be effective in our observations as well.

H. F. What is forcing you to demand this correspondence between the world and perception in this absolute manner? It's enough to know that there is a pretty red-haired girl standing in front of us, or a red cube, or a table with a red tablecloth. All we know is *that* we are perceiving something and not more than that. Normally we assume that our senses confirm the objects in the world in a manner that is mutual. You see a table, go over to it, run your hand over the wood, and then believe that your sense of touch has ultimately verified the existence of the table and the perception of your eyes. This notion of confirming things just seems silly, because in this situation, the existence of an entity that is ultimately identified as a table has already been assumed at the outset.

B. P. So you think that the idea of verification is already ontologically contaminated because it claims that things are actually present "out there".

H. F. Precisely. How do you propose to know that something is there whose presence you first want to verify? In my own personal jargon, I would replace the notion of confirmation with the notion of a correlation between sensations. You see something, you feel something, and the correlation between your sensations and the entire gamut of neuronal processes creates a world that you can call a table, a cube, or my pretty friend with the red hair. As I see it, the correlation of the sensations is the precondition for what you referred to as the world's abundance of nuances. Because of the fact that these sensations are all so different, and because different things that can be seen, heard, and felt, are continuously being correlated, this abundance of perceptions and the fascinating palette of the world are created, and can be enjoyed.

A short skit

B. P. Would you mind if I made another attempt, this time from a different perspective, to argue for the assumption that there must be a systematic connection between our perceptions and the real world? For example, one could argue that as a result of constant and at times fatal trial and error, in the course of evolution, the human perception apparatus has adapted to the reality of what exists. This was the conviction of the ethologist and evolutionary epistemolo-

gist Konrad Lorenz, who thought that in the course of evolution there was a gradual approach to the Kantian *"Ding an sich"*, the real world. According to Lorenz, constructions that completely missed reality are simply destroyed by the mechanism of selection.

H. J. My spontaneous reaction is to cry out, "Poor Konrad!" This assumption is the result of *his* evolution and constant attempts on the part of himself and the people who worked with him to correlate their own experiences and observations according to the principle of similarity. His ideas are based on Linnean taxonomy. This is how the cognitive characteristics of Carolus Linnaeus, Konrad Lorenz, and many others who searched the plant and animal kingdom for similarities gave rise to the fascinating line of descendants of an evolution. Distinct categories were set up and plants and animals could be classified using similarity as the most positive characteristic. This system allowed them to relate their own observations as they preferred, thus placing the giraffe and the goat in a close relationship and the frog and the giraffe in one that set them far apart from each other. I would just like to point out that that was a time in which people used the *similarity of impressions* as the basis for categorizing plants and animals. Here the early taxonomies of Ulisse Aldrovandi from the sixteenth century come to mind. He divided the animals into groups consisting of the monstrous ones (spiders, salamanders, and snakes) and the beautiful ones (leopards, eagles, etc.). At the moment it is just fashionable to choose other characteristics as criteria and to draw up a model of evolution that leads to these types of statements.

B. P. Is this little tangent on the historical aspects of biological taxonomies indeed the answer to my question about Konrad Lorenz and the theories of evolutionary epistemologists? After all, Lorenz wrote, "Adapting to certain conditions of the environment is equivalent to acquiring information about these environmental conditions."

H. J. I can only repeat what I said before. We are talking about a certain notion that gives rise to these types of statements. Against the backdrop of certain historical and social conditions, one attempts to answer questions about the evolution of the species and claims

that a gradual adaptation to the environment is taking place. And this is how what we call the environment becomes the external determinant of what is inside us.

B. P. If I'm following you correctly, you do not pose the question as to who is correct and who is in possession of the truth about the evolution of the species, the existence and determining factors of the environment, and the phenomenon of adaptation. Instead you simply vet a different understanding of all this against the one put forward by Konrad Lorenz.

H. F. Precisely. I just don't care about the horrible question of who the heck is right or not. I'm just not interested in that kind of discussion, because it is dominated by intolerance and quarreling. I'm not the type of person who is interested in refuting other people's arguments and in so doing sink my teeth into them and become more and more like them. I simply want to request that we look at things from another perspective, and I would like to point out that you could actually turn Konrad Lorenz's statements around. In fact you can turn anything that you hear upside down. For example, if we view ourselves as the inventor and creator of our environment, something I strongly believe in, then the problem of adaptation is one that we don't have to worry about at all. Because you can't invent something that you can't invent and that doesn't fit with yourself. So that means that we are always adapted, no matter what. And understanding this is what can bring people closer together. They become the father or mother of every thing and of every phenomenon.

B. P. In order to emphasize the contrast and the variety of differences between the views, perhaps it would make sense to reformulate them in the language of causality. In Konrad Lorenz's theory, the environment (not the observer) is accorded primacy. The language of causality would put it this way: The environment is the cause of experiences. The result is adaptation, which is equated with gradually coming to know the real world. You have reversed the order. The experience of the organism has primacy and observations are the cause. And the creation of a world, which is understood as a sum of ideas, is the result.

H. F. Of course, you can definitely put it that way. I once wrote a short skit that may help to illustrate my view of things a bit better. The skit takes place in a theater with an audience. All of a sudden, the dazzlingly beautiful velvet curtain rises and you can see the stage. On the stage are a tree, a woman, and a man. The man points to the tree and says in a loud and dramatic voice, "There's a tree over there!" Then the woman says, "How do you know that there is a tree over there?" The man answers, "Because I see it!" Then the woman, with a slight smile on her face, says, "Aha." And then the curtain drops. I think that this little skit does an excellent job of shedding light on the age-old discussion about the questions of knowledge and the role of an external world. This discussion goes on and on, and continues with Konrad Lorenz. For ages we have been ruled by the question as to whether we should side with the man or with the woman in the skit, and this question cannot be settled. The man claims that the existence of the tree is independent of an observer. The women, however, points out that he only knows about the tree because *he* sees it.

B. P. It appears that you can support the woman's view of things in the skit more than the man's. Perhaps this means that your epistemological assumptions should actually be situated between two different extreme positions. On the one side, there is the naive realist who is saying, "The things, the trees, the people and all the facets of the world are represented on the big screen of my consciousness exactly as they are." And on the other side, there is the solipsist who is saying, "Everything is a chimera, the product of your own mind." I'm assuming that your ideas can be placed between solipsists and naive realists. Whatever can be called *real* in an absolute sense can never be decided, but there is no doubt that something exists there.

Decision against solipsism

H. F. Your attempt to put me into a certain category and all of this epistemological vocabulary that you are using so expertly, are making me a bit unhappy. That's because the position that you have assigned me to once again leaves a back door open that permits the terrible idea of ontology – the doctrine of ontic existents – to reenter. If you follow this position, you start speaking about the existence of

an outer world again. The way I see it, referring to the outer world and ontic existents is the perfect way to shirk one's own responsibility. That is the extraordinarily terrifying thing about ontology. You start using the formula "it is", which on its own is harmless enough. (Just for the fun of it I once used the lofty expression *existential operator* to refer to this.) Then you utter it with authoritarian force: "It is like this ... there is ..." And whatever. But who says there is something? Who claims that something is the case? It is my plea that we see this thing that appears to be real and is assumed to be existent as something that we ourselves have created and invented.

B. P. The idea of inventing reality appears to me to be like a flirt with solipsistic ideas. Nothing is real and everything needs to be questioned.

H. F. Why? What is solipsistic about it? You're sitting across from me and we're talking together. We may even shake hands. That isn't an illusion, nor is it a chimera. Of course, your next question is going to be whether that doesn't mean that I am accepting an external reality. My answer would be, no, not at all. What I would say about it is the following: By hearing my voice, shaking my hand, and through the constant correlation of the extremely varied sensations, you are constructing a Heinz. And in order to be able to speak about a Heinz von Foerster and a Bernhard Poerksen, we invent a reference that we identify as *reality*. The solipsist claims that he or she is alone and completely lonely – *solus ipse*. The other person is nonexistent. Nothing else exists.

B. P. But if you describe the world as an invention, then being alone and cognitive loneliness are the necessary consequences.

H. F. All right. I understand what you mean. But I would still like to invite you to follow my thoughts on solipsism for a moment. It is possible that this *two-legged animal without feathers*, as Plato would put it, this person Heinz von Foerster, can conceive of other two-legged animals without feathers. And I cannot deny that there are more two-legged animals without feathers, other human beings, that are part of the world as I conceive it. Since they are similar to me, I have to grant these imaginary figures the right to think solipsisti-

cally. It could be that in the thoughts and the imagination of these people, other people might appear who claim that other people do not exist. And one of these people could turn out to be me.

B. P. So a solipsist imagines a solipsist who imagines a solipsist who imagines a solipsist. To be honest, I still don't understand how this example is supposed to defend you from the notion that you appear to be a solipsist yourself.

H. F. My friend Gordon Pask once came up with a beautiful sketch that illustrates this situation (Fig. 1). You see a man wearing a bowler hat who claims to be alone. And this man imagines another man who is also wearing a bowler hat. He also imagines that the other man that he imagines doesn't exist and is just a figment of his imagination. Now it could actually happen that the following situation might arise: A man who thinks along the lines of solipsism meets another man who thinks the same way.

B. P. Now the question arises as to who is right – the first or the second solipsist?

H. F. That's the crux of the matter. At this point in the conversation, I'd like to serve up the so-called principle of relativity, for the purpose of clarification. The principle of relativity says that a hypothesis that is true for A and for B can only be acceptable if it is also valid for A *and* B together. For the purpose of illustration, you might think of the well-known question as to whether it is the sun or the earth that is the center of the universe. It is plausible that there are beings on Venus and on Earth who would maintain the hypothesis that their respective planet is the center of the universe. As soon as these Earthlings and Venusians meet, they will begin quarreling and a war will break out. Who is right? Who is in possession of the truth? In order to settle the fight, the principle of relativity can be used. You can demonstrate to the Earthlings and the Venusians that if they accept this principle, they cannot both be right. The principle of relativity is thus neither true nor false. The question is, then, whether you will choose to accept it or not. That is a decision that everyone has to decide for him or herself. The Venusians and the Earthlings could now decide to become heliocentrics and regard the sun as the

Fig. 1 A man who claims that another person doesn't exist imagines another one who claims that another person doesn't exist (Illustration by Gordon Pask).

center of the universe. If they chose to do so, they would enjoy living together and would even be able to exist alongside the Martians in peace and harmony.

B. P. If I understand you correctly, by introducing this principle, you have created a notional figure for speaking about the environment, objects, and other human beings from your perspective and in a manner that is not realistic. The world is connected to the knower. It is this one who knows who decides whether the world exists or not.

H. F. Well put. The principle of relativity creates a form that allows one to speak about the environment and other human beings.

And once I postulate the existence of another human being and my own existence I begin living in a relationship and as part of a community and begin participating. One suddenly becomes empathetic and it is no longer possible to find an excuse for one's own apathy by referring to an external reality. The decision I am proposing here turns one into a social being. Conceiving of the world as an invention means seeing oneself as its creator. And this gives rise to the responsibility for its existence.

2. Facets of Truth

Truth means war

B. P. These radical thoughts inextricably intertwine every act of knowledge with the one who knows. They discredit a particular notion that is at the very core of any kind of scientific, religious, or everyday attempts to perceive the world. That notion is the notion of truth. The prerequisite for understanding the truth is a world that is independent of observers. One of the most popular ways to define truth is as an *adaequatio intellectus et rei*, meaning as a correspondence between thought and being. In talking about this idea of truth, philosophers speak about a correspondence-theoretical determination of the notion. One's notion and the world begin to overlap and eventually achieve an exact correspondence. Perhaps it would make sense for us to use this definition when we talk about the facets of the concepts of truth.

H. F. No, I don't agree with that at all. I'm not worried about a definition. I could care less whether we define it from a correspondence-theoretical, consistency-theoretical or whatever perspective. To be honest, the notion of truth is a chameleon in the history of philosophy. It just takes on whatever color the user wants it to have. Descartes gave the notion spots, Kant gave it stripes, and Schopenhauer gave it dots. It seems to me that a definition, and this one is so difficult anyway, is not a very good starting point for a discussion. I would prefer to eliminate the notion of truth altogether, because the way it has been used has led to so much misery. It gives rise to lying; it separates people into those who are right and those who are not right. As I have said before, truth is the invention of a liar.

B. P. What do you mean by that?

H. F. I mean that truth and lies give rise to each other. When you speak about truth, you turn the other person into a liar, whether you do so directly or indirectly. The two notions are part of a category of thinking that I would like to remove myself from in order to get a brand new view of things.

B. P. So that means that when it comes to the truth, you aren't a correspondence theorist or a consistency theorist, but a *consequence theorist*. You aren't concerned with the content side of the notion, but rather you have focused on the social exterior of this idea. Your view is trained on the atmospheric results that the notion of truth has, regardless of the content side of the definition.

H. F. The term *"consequence theory"*, which you have just invented, sounds quite good, yes, I like it. It's correct that the way I see things is that talking about *the truth* has disastrous results and destroys the unity of humankind. The notion means war – just think of the Crusades, of the endless wars of faith, and the horrible faces of the inquisition. You can't help but think of how millions of human beings have been mutilated, tortured, and burned in the process of insisting on the notion of truth with violent means.

B. P. Do you see a correlation between the number of people who died in wars and a static notion of truth?

H. F. I do. All at once the huge armies of believers are standing across from each other. They kneel down and they all pray to their God that the truth, their truth, will be victorious. Who is right? Are the wine and the bread that are shared at the Christian communion really the blood and body of Christ, or are the wine and bread symbols that stand for the blood and the body? In order to answer this question, slaughter upon slaughter takes place. And the army that survives announces that the truth is in their private possession. They can now start to convert the survivors on the enemy's side.

B. P. If I understand you correctly, the reason that you have rejected this notion of truth is one of ethics. But don't you agree, from the point of view of epistemology, that truth is produced in places with scientific and technological progress? We use the telephone, we drive our cars, and planes weighing tons and tons take off every minute. This can only mean that there is a systematic relationship between our ideas and the essence of the world. Let's put it this way, this time as a question: Isn't the fact that our hypotheses appear to work proof that we have managed to capture the hidden workings of nature?

H. F. It is man's desire to explain his skills and his opportunities – driving a car, flying, the magnificent computer. However, these explanatory principles are conditioned by culture and they vary widely. You can choose which ones appeal to you and jump back and forth from one to the other. A realist would use the Maxwell Principle to explain the way an electric motor works. And a sorcerer would say that people have learned how to deal with things that cannot be explained. But if you want to know my opinion, I personally see the idea of being able to explain things down to the last detail as a type of hope that quells and stops man's wonder. You can then live in a world in which astonished wondering and the unknowable have ceased to exist. That is the result of our attempts to explain everything.

B. P. What you are saying appears to me not to be an answer. You have turned the implications of my question into the topic. You have arranged them properly, but you are not giving me an answer.

H. F. Well, I suppose I'll toss the question back to you. What answer are you looking for? What would you like to hear? What response would you accept and which of my explanations is the one that you would enjoy the most? I'm not about to profess that I believe that the fact that a hypothesis works is evidence of truth, no matter how good that might make anyone feel. According to my formula, the fact that something works is proof that something works. Why should I equate that with the silly five-letter word T-R-U-T-H? What for? To be right? To rub someone's nose in it?

B. P. So you don't believe in the ultimate verification of a hypothesis?

H. F. No, not at all. What is possible – and here I agree with the philosopher Karl Popper, with whom I have not agreed on many things for quite some time now – is the falsification of hypotheses. They can prove themselves to be false, but not to be true in an absolute sense. But the minute you start talking about truth, a politicum is created. This leads to the attempt to dominate other understandings and to rule over other people. If the notion of truth were to vanish from the face of the earth, we could probably live together in peace and harmony.

B. P. The only thing that is left, then, is a completely unspectacular epistemological motive. The only thing that is important is the way something functions, not the absolute truth.

H. F. But this functioning can be understood as a series of miracles, that we can celebrate and can be happy about. The point is not to stumble in this world. And if we were actually to succeed in doing this, that would be an occasion for breaking open a bottle of champagne together. May I repeat that I would like to stop participating in the entire discussion about truth and lies, and subjectivity and objectivity. These categories disrupt the relationship between one person and another one. They give rise to an atmosphere in which people are convinced, converted, and forced to do and believe things. Enmity arises. We just shouldn't use these words any more, because the way I see it, mentioning them in passing or even denying or rejecting them keep them alive.

B. P. How so?

H. F. That reminds me of something Ludwig Wittgenstein once said: If one speaks about a proposition "p" and its denial "non p", according to Wittgenstein one is speaking about the same thing. Do you mind if I bring up a little analogy? Revolutionaries who want to dethrone a king often make the unfortunate mistake of shouting loudly and clearly, "Down with the King!" This of course is free propaganda for the king, who actually should thank his opponents profusely: "Thank you for mentioning me so often and for not ceas-

ing to call out my name!" If I negate a person, an idea, or an ideal loudly and clearly, I have not managed to ultimately separate myself from it. The phenomenon that I have denied will come back and ex negativo will turn into the center of attention.

B. P. Well, then I suppose we could say that you are a revolutionary who wants to completely eradicate the idea of truth by eliminating it from discourse.

H. F. That's pretty good. I know a phrase that might fit with that quite well. It is passed around among Austrian journalists and it says that the best way to demolish an idea or a person is to simply stop talking about it. It goes something like, "May he never be mentioned again!" If you want to destroy a politician, then don't write about all of his extramarital affairs. That's going about it in completely the wrong manner. The mere mention of his existence is enough to conjure him up in the people's minds, and some of them might even react by saying, "What a great guy!" It is much more effective to talk about other things like the weather and the barometer readings. Then the politician will be completely out of the picture. What I mean is that the idea of truth should be made to disappear, and the way to do this is to simply stop talking about it. "May it never be mentioned again!"

B. P. Well, don't you think it would be possible to assign the notion of truth a less dramatic role and to perceive it more as a regulative idea? One could see truth as an orienting norm that couldn't end up in the sole possession of an individual, a group, or a nation. It would then appear as a motive for an awakening and as the stimulus to make an effort towards knowledge, and it would be clear that this effort can never have an end or be absolute.

H. F. I just find your attempt to salvage the notion of truth to be quite unsuitable. Talking about the truth in a regulative sense requires one to have an idea of what the truth is and what should be achieved and striven for. In line with this, the destructive consequences of this idea will not even enter the picture. There is an automatic assumption that there is an eternal truth floating out there on the horizon somewhere. Even the notion of the orienting norm that

you talked about contains a hidden pressure to conform. Other people have to surrender to this norm.

B. P. And yet I think you cannot deny that an emphatic and perhaps even naive notion of the truth has stimulated people throughout the history of culture and science in a very productive manner. If you see the motive of truth in this way, it is quite good, and it is not just the instrument of fanatics who set out to terrorize other people.

H. F. Now you're talking about the personal doctrine of one who knows and is using a certain idea in a wonderful way. Yet if this same person says that she has found the truth, she becomes extremely dangerous. I even find the claim that a person has approached the truth in a gradual or asymptotic manner very scary, because this presupposes the knowledge about where this distant goal is located. Sometimes I wonder whether it wouldn't be possible to substitute the concept of truth with the idea of trust. After all, if you check your etymology, the English word "truth" goes back to the word "trust", which includes the notion of loyalty. If I see truth as trust from person to person, I no longer need any external references. Then I can simply accept what the other person says because we are loyal to each other. The question ceases to be who is right and who is lying, but instead is whether we can trust and rely on the other person. For example, if the person says that rattlesnakes play the Radetsky March, I don't ask whether or not they *really* do this. I simply trust that what the other person says is correct, I believe him or her. And in this way, a completely different relation emerges.

B. P. Doesn't this criticism of the concept of truth neglect a basic need that we have? People can't survive without yearning for something that is finite and without any questions. They need the certainty that there is something absolute.

H. F. For me, this certainty of the absolute that is supposed to render stability is a dangerous thing. It robs human beings of their responsibility for their perspective on things. My goal, however, is to place a greater emphasis on each person's own responsibility and individuality. I would like to see people learning to stand on their

own two feet and to trust their own personal perspectives. It would be my desire to help other people to develop their own ideas, their own thoughts, and their own language; to help them to refine their gift of observation and to use their own eyes and ears. Of course there are people who don't want to know anything about this and believe that they cannot survive without having a dogma that tells them how they have to see, hear, and speak. I call them "monodancers". They are people who are impossible to dance with and with whom it is impossible to start up a dialogue. They turn down the invitation to talk about these things, because they already know everything. They know the results. But it's not my problem if other people run away into blindness towards the huge number of possibilities. They have to manage to deal with this themselves. I would never attempt to convince them otherwise.

B. P. There is no doubt that many people consider your ideas to be quite provocative. A few years ago, an interview with you appeared in a Christian weekly and triggered off a whole series of letters to the editor. It seems that many of the letter writers felt hurt by this break with an ideal of the truth, which is central to religious notions. One of the people called you "The Great Confounder". That is a quote from the Bible: The Devil plays the role of the Great Confounder.

H. F. Now, that actually doesn't sound too flattering. But I'd like to point out that I have a different notion of the Devil. I don't think of the Devil as being the Great Confounder, but instead as the Great Unifier. The Devil tries to homogenize the different perspectives until everyone thinks, believes, and acts the same way. That's the dangerous thing. In contrast, the Confounder enlarges the field of vision, opening up new possibilities and revealing the abundance. My message to the writer of the letter to the editor is one of reassurance. A mind that confounds is a good one.

The ethical imperative

B. P. Do you think that the creation of new forms of perception and new choices for thinking and acting would be a good thing in general?

H. F. I think that confusion allows new choices to be revealed and that an ethical principle is manifested. Freedom emerges. I once said,

"Act always as to increase the number of choices." That is my ethical imperative, although once again one might have the impression that I am trying to order people around, and this is just not right. I didn't choose my words very carefully when I said that. It would have been better if I had written, "Heinz, act always as to increase the number of choices."

B. P. Could you explain this ethical imperative?

H. F. What I mean is that you shouldn't try to limit the activities of other people. Instead, you should behave in a way that increases the freedom of others and the community. Because the more freedom one has, the more choices one has, and the better the chance that people will take responsibility for their own actions. Freedom and responsibility go hand in hand. The only people who can act in a responsible way are those who are free, and who are always able to choose how they want to act. That means that if you rob someone of their freedom and shackle them, you also take away their chance to act responsibly. And that is irresponsible.

B. P. But whose choices need to be expanded? Just to pick an example out of the air, you can't support the opportunity of a propagandist to distribute vicious and inflammatory literature. That cannot be a goal.

H. F. Why not? Should I ban his or her literature, and remove the books from the libraries because they contradict what I believe in? The alternative is terrible. If you expand the choices people have, then they can decide whether they are going to become a child murderer or a school bus driver. The decision to make one decision or the other connects a person to responsibility. Of course it's easier to rid oneself of the responsibility by prohibiting something or blaming one's circumstances, one's genes, or one's upbringing in the sense of nature or nurture. And it is easy to hide in a hierarchy and when the day comes that one is brought before a court once a war is over to say, "But I was only following orders. I can't help it! I had to do it!" In my opinion, these are all just excuses.

B. P. Don't you think that once in a while it's all right to be intolerant and that the distribution of certain propaganda materials, such as Neo-Nazi writings that incite violence, should be banned?

H. F. All I can say is that I wish you all the best with the strategy of strictly forbidding things. In my opinion, censoring things has never worked. My strategy would be to illustrate the absurdity of Neo-Nazi ideas using other ideas that also need to be allowed the opportunity to be distributed.

B. P. You mean that "enlightenment" alone is enough to ensure the triumph of that which is good, right, and beautiful?

H. F. You seem to be a real expert in this area. What gives you the idea that you know what this "good, right, and beautiful" is? Who does either of us ask if we want to find out about this? The consequence of making an absolute distinction between what is good and bad, right and wrong, beautiful and ugly, is that one appoints oneself to be a judge and sees oneself as someone who is great and just and who has everlasting knowledge. Don't get me wrong. I am not pleading for ethical relativism, not at all. That doesn't have to be the consequence. But I would like to point out that you are actually making these kinds of distinctions, and you are presupposing that they are universally and absolutely valid. They are not something that is outside your person. You are the one who is responsible for implementing them.

B. P. This tolerance for other people's reality could make it so that it is impossible to act at all. What about the way cows, fish, and cauliflower experience things? If I want to eat them, I will annihilate their world and destroy all of their choices.

H. F. What is your next question, why do I eat cauliflower? Do you want to know whether, according to this ethical principle, it is nice to fry up a steak or not?

B. P. Not exactly. But I believe that in order for human beings to live out their lives, they are always in the process of destroying

something. There is no way around it. We are always destroying the possibilities for other beings to grow and develop.

H. F. Of course, my ethical imperative does not refer to the choices of an individual being, an individual person, or an individual cauliflower, but rather to the huge number of choices for the universe. That is what is meant. And of course I could say, "If I eat a cauliflower, I can write a beautiful piece of poetry that could not be written if I were to go without food. Thus, I have given the cauliflower the opportunity to create a beautiful piece of poetry." But that of course is an excuse.

B. P. How would you answer if you didn't use this excuse?

H. F. I'd look for a different excuse. By the way, I'm getting a real kick out of the way you are reducing my ethical imperative to absurdity. That just shows that every statement has a finite range. All I want to do is to urge people to consider the wide range of choices. We are free to choose, we are free to decide. There is not some absolute truth that forces a person to see things in one way but not another or to act one way but not another.

Loss of the archimedic point

B. P. This basic doubt about the knowledge of truth and the sudden confrontation with a wide range of choices can strike one with a bout of epistemological dizziness that can give a person the feeling that their legs are about to give out from under them. There is no longer an archimedic point that could provide something to hold on to. The neurobiologist Humberto Maturana once reported that when he started thinking in this way, there was a period during which he was afraid he would go crazy. Are you familiar with this kind of fear?

H. F. No, unfortunately not, and that is definitely one of my flaws. When I began thinking like that it was quite fun. I felt as though a burden had been lifted from me. I felt that I was becoming free and felt relieved. I thought, now I can finally hold out my arms and enjoy the openness of the horizon. Now I can let my soul soar and become a bird that can see everything in all its depth and breadth.

B. P. I would like to know how this ideal truth, which you consider to be so destructive, can be criticized in such an easy, flexible, and tolerant manner. Criticizing the dogmatism of truth shouldn't turn one into some anti-dogmatist who makes up statements that are equally dogmatic. So please answer this: Which method or language should one use to make sure that one remains flexible, at least to some extent?

H. F. I think it is important that one has a demeanor that is humorous and playful. Fun and games, humor, and silly jokes all seem to me to be different possibilities. You have to invite the other person to join you in a game that pushes these fatal categories of thought into the background or even make them disappear altogether. For example, my students and I have made an agreement that every time one of us uses a word like "reality", "really", "truth" or "objectivity", the person has to put a few dollars in the pot, which we'll use at some point to do something together. Of course one can speak about *"reality"*, but that will cost the person two dollars. And talking about *"the truth"* can be pretty expensive. This little game helped us to develop an awareness of the authoritarian power of these types of formulas, and it taught us to use another type of language.

B. P. Can you describe this?

H. F. It means having a dialog between myself and the other person that takes place without any references to things outside the situation. If one just stops for a moment and says, "The person who is producing this view of the world is you. It isn't outside, and it isn't some so-called objective reality that I can relate to," a very unusual emphasis on the respective personality of the person speaking occurs. All of the general statements that begin as "This is the way it is!" begin turning into statements that start with "I think that ..." To return to rather lofty terminology, one uses the *self-referential operator* "I think" and decides not to use the *existential operator* "it is". In so doing, a completely different relationship emerges that permits a dialog that is free and actually quite nice.

B. P. Could you describe this language, that transcends the system of coordinates of realistic and objectivistic assumptions, more pre-

cisely? Or, let's put it another way: What type of form does one find to talk about these questions without something set or a static system arising?

H. F. That's something I just don't know myself either. You can only speak this other language. You can only attempt to invite other people to join in a game that we call *"reality"*. I would love to be able to be so completely in control of my language that no matter what the dialog, be it about politics, science, poetry or whatever, the ethics in the dialog would remain implicit, so that if I have made a particular statement I remain a respectable person. A person who does not attempt to force anyone else to do something. A person who doesn't appoint him or herself to be a judge or police officer, but who allows the other person his or her space. That is why I don't have any kind of criteria or checklists for the ultimate "correct" language and method of presentation.

The metaphor of the dance

B. P. Does that mean that you believe that one cannot discuss the criteria for what we have determined as a *"good"* language because doing so would mean that we are reestablishing a general agenda and a norm or a compulsion?

H. F. Yes, that is definitely a danger of discussing these points. In fact, it might even be better not to use attributes like "good" or "bad" which so clearly categorize the language in a way that is judgmental. Once these attributes become explicit, an atmosphere of discreditation arises again. The emphasis is placed on the things that serve to separate people and not on what serves to connect them. The focus is on what disrupts the relationships. I would like to act and have my language under control at all times such that these questions about good or bad behavior, which always contain the danger of the tendency to moralize, no longer need to be explicitly discussed. I wish with all my heart that I will be able to speak in this way and try to do it as well as I can.

B. P. Aren't there any other choices for talking about these characteristics of this implicitly ethical language use that don't even allow the age-old dispute about the truth to arise in the first place? I can

understand that you are not interested in talking about "objective necessities" or a static distinction between "good and bad". But could you give us some type of images or metaphors that might shed some light on what you mean in a more indirect manner?

H. F. I personally prefer the image of dance, but of course that doesn't have to be valid for anyone else. In English you say, "It takes two to tango!" You need the other person and attempt to dance with the world. People take turns leading, feeling the next step together, using the movement of the other person to merge into one and the same person, to a being that sees the world with four eyes. Reality becomes mutuality and community. You don't have some agenda that you follow that says it's time to dance. You just dance, you just do it. And suddenly you turn and discover something new and completely unexpected.

B. P. That is a fantastic image, an absolutely wonderful metaphor. The goal of a move that is part of a dance is not to change location as quickly as possible in order to get from point A to point B. It is the move itself that is the key thing, rather than being merely a means of reaching a destination.

H. F. That's exactly how I see it. I'd say that it is a matter of a self-referential movement. The goal of dance is dance. Dance emerges through dance. The Buddhists say, "You lay a path in walking it!" A path is not something that continues throughout eternity and which is predetermined. No, the path is laid as one walks on it, as one moves.

3. The Danger of the Label

Skeptical remarks on Constructivism

B. P. I think it is necessary at this point to mention that many of the ideas that have been touched on in our conversations on truth and perception so far have already been given names. In both the academic and the non-academic world they are being hotly debated under the designation of *Constructivism*. We can open various encyclopedias of philosophy and read that you and several other au-

thors were the ones who shaped and inspired this school of thought, which has since been developed in a wide variety of ways. Yet you don't appear to wish to take credit for "fathering" this school at this point. To put it more precisely, you have yet to use the word "constructivism" in our conversations.

H. F. Well, this is another word that I wouldn't mind eradicating from the language. I mean, according to my own rule, if I were to use the word, I would have to pay you a few dollars. That is why I am so careful not to use it. I'd prefer to keep my dollars for myself.

B. P. What was your first encounter with this school of thought that we refer to today as constructivism? Was there some particular event that led you to it?

H. F. In 1972, Wolfgang Preiser invited me to one of the early conferences on ecology. At the time, my friends had just discovered the environment in terms of an entity that was separated from the human being and which had to be protected from our attacks. During this conference I held a lecture that was entitled, "On Constructing a Reality." It was my objective to portray this environment as our creation and invention and to bring it back into our area of responsibility. In so doing, the destruction of the environment could be perceived as self-destruction, and the rigid distinction between inside and outside would be rendered irrelevant. At that point I didn't know anything about the constructivist school of thought that is all the rage these days.

B. P. But you are a constructivist. And, to put it in plain English, you claim that every person constructs his or her own reality as a member of a certain culture or community or even as an individual that is attached to his or her particular biological constitution.

H. F. No, no. I am Viennese. That is the only label that I have to accept. I come from Vienna; I was born there, that's an established fact. Of course, you are correct when you say that there are a few people who claim that I am a representative of a certain epistemology. But that just isn't right. I don't have any epistemology at all. No, I am astounded and allow myself to be fascinated by the world

and try to understand it. This morning, before you came to visit, I sat down at my desk and discovered a tiny fly that had landed on the book I had just been reading. I looked at this fly very carefully with a magnifying glass and allowed myself to be fascinated by its eyes. I saw and observed the movements of its legs. Until it flew away. Perhaps I bothered it by moving too much or whatever. Do you understand? That is something that is just incredible. It's a miracle. How does that tiny fly do that? Why can it fly, land on my book, mate, establish a family? Its brain weighs a bit less than a microgram and the fly itself is only one millimeter long. So how can this tiny thing do all this? It survives all on its own, without our help. That's what is important. I'm not interested in some epistemology. My knowledge theory is actually what one might call *Curiology*.

B. P. So you don't want to be pinned down?

H. F. I just don't appreciate any of the jargon. When people talk about constructivists and realists, objectivists, subjectivists, and postmodernists and start using all this terminology, I just feel like saying, "Thank you, that will do. I'm off to the movies. That's way more interesting." Let's drop all these labels when we talk to each other and discuss these topics. Why should we jump on the bandwagon that rides around all these public debates and arguments? Some people call themselves relativists or realists, constructivists or deconstructivists. And there's another group that has a sign with *Postmodernism* around its neck. Some bandwagons are motorized and others move by horsepower. They all rush around and the result is that in the end, nobody listens to anybody any more.

B. P. But these labels serve to trigger off a productive discussion. You can use this type of position to defend yourself against whoever else's presumptions. That was Paul Feyerabend's political and epistemological agenda. He used the relativistic slogan "Anything goes" to protest against an objectivism that was too powerful. And you can turn this around. At a time in which relativism is fashionable and leads to sectarianism in academic circles, you can strengthen objectivism. No matter what, the end result is momentum.

An attempt to get around the big words

H. F. You appear to me to be an excellent teacher. What you have just suggested is an excellent pedagogical or even political strategy for getting a dialog off the ground. But that can only serve as the starting point for injecting a bit of life into the relativistic and objectivistic club. I'd prefer to step out of the limelight and leave this whole circus altogether. My objective is to get around the big words, bursting all these linguistic balloons and inspiring people to take constructivism with a grain of salt. You have to keep in mind that this is a special kind of game that is being played here. You try to impress the other person with your lingo, reckoning with the fact that he or she isn't very sure about what you're talking about, which causes them to feel inferior.

B. P. What do you have against the word constructivism? Is it the "*ism*" per se that makes you so wary of some ideology?

H. F. The problem is that labels like these interfere with understanding and listening to each other. It doesn't matter whether it's constructivism or Schnapsodivism or Smacksodivism that is being forced into whatever philosophical or other category. It inevitably leads to one slapping a label on it before it has even taken shape.

B. P. So you think that a label forces a person's musings too strongly in a certain direction?

H. F. Oh, it's more than that. It kills the whole idea. A club grows up around it and people begin to quarrel. "Should we put it in the category on the right or on the left, at the top or at the bottom?" Or do we need to make a distinction? Maybe Humberto Marturana isn't a constructivist at all but rather a "forthcomist" because he's forever talking about "the forthcoming of reality" instead of about the construction of reality. Should the ideas of a certain Heinz von Foerster perhaps rather be placed in the area of postmodernism? Should we perhaps denote Ernst von Glaserfeld as a "fittist" because he points out to us that our inventions need to fit reality? No, I believe that the very name of constructivism already represents a catastrophe for the world of ideas underlying it. In my opinion, what is referred to as constructivism should remain a pure and simple

skeptical attitude that casts doubt on the self-evidence of realism. Then it might be easier to speak more freely. You could point out other points of view and free yourself of predetermined judgments and ways of thinking. That at least is my sole intention.

B. P. I think that your categorical rejection of all this vocabulary is quite exaggerated, because it completely overlooks the function of these types of conventionalized and admittedly trendy labels. They are quite simply economical and allow us to speak with each other on the basis of a sort of preliminary understanding without always having to clarify the basic notions at the outset of every discussion.

H. F. What you refer to as conventionalized understanding and communication I would see as a misunderstanding and non-communication. I would consider it much more pleasant if people would listen to me without slapping some label on me right away. "Heinz von Foerster – that's a constructivist." And those are the people who believe that everything is an illusion and that there aren't any real objects rolling around in the world. I'd be much happier if people would ask, "Who is that Heinz von Foerster? Of course he's crazy, but who is he? What is he trying to say?" As soon as people begin asking these questions they begin to listen. Our discussion is provided with a basis. And the dance of a dialog à deux can begin.

4. Explaining the Explanation

Cause and effect

B. P. From this skeptical perspective that opens new opportunities for perception, a pattern of thinking can be observed that you have often touched on in your lectures: the explanation or the explanatory principle. But first things first: What does it mean to make something comprehensible and transparent or to explain it?

H. F. Gregory Bateson's famous metalogue does an excellent job of showing how an explanation comes about. In this metalogue, a daughter asks her father, "Daddy, what is an instinct?" He answers, "An instinct, my dear, is an explanatory principle." And she asks, "But what does it explain?" Her father says, "Anything – almost

anything at all. Anything you want it to explain." She replies, "Does it also explain gravity?" And he answers, "If you desire, it could also explain gravity. We could simply say that the moon has an instinct whose strength varies inversely as the square of the distance ..." The daughter says, "But that's nonsense, Daddy." "Yes, surely," the father replies, "but it was you who mentioned 'instinct,' not I." Then the daughter says, "All right – but then what does explain gravity?" And the father says, "Nothing, my dear, because gravity is an explanatory principle." The daughter says, "Now what is that supposed to mean?" And the father answers, "Now you know what explanatory principles are. Any statement linking together two descriptive statements is an explanatory principle. You do something like look at the moon and you say something like, *"Today it was here. Yesterday it was there!"*

B. P. Does the father intend to tell his daughter that explanations are our constructs?

H. F. He wants to show her that it is a matter of semantic phenomena. You see the moon on one day in a certain place and on the next day in a different one. You link these two observations through the so-called law of nature, which – one thinks – has caused the moon to change position. We then call this a causal explanation. And this has a triadic structure. It includes a cause, an effect, and a rule of transformation: A law that is the basis for the change that you have observed. You hold a piece of chalk in your fingers, spread your fingers, and the chalk falls on the floor. The observation that you can make is that the piece of chalk falls. The cause for this can be understood as your spreading your fingers and the effect is the falling of the chalk. The rule of transformation is identified as gravity. But on the other hand, ever since Ludwig von Wittgenstein, we have been aware of the fact that the belief in a causal nexus is a present-day superstition.

B. P. Are you trying to say that explanations are not true imitations of nature and that they don't correspond to anything in reality?

H. F. In any case it is clear that laws of nature can be written by us and that they are invented. This can be easily demonstrated, but of course we are already aware of this.

B. P. That isn't something we know – that's just something you claim.

H. F. A law of nature always has an author. According to the laws of Sir Isaac Newton, the planet Mercury is not a very obedient follower of this law. It doesn't show up at the calculated spot at the predicted time. So now what do we do? When somebody draws up a law that forbids people from stealing apples, and somebody steals an apple, it is generally the person who steals the apple and not the lawmaker who is punished. The situation is cut and dry. But in the case of the planet Mercury, which thumbs its nose at the law of nature, this is not quite so simple. From a legal perspective, should you punish Newton or Mercury? Who should go to jail? The person who invented the law of nature that is not suited for describing the movements of the planet Mercury, or some planet that doesn't behave the way we predict it will?

Laws of people and laws of nature

B. P. I'm getting the impression that you are mixing two categories at the moment that actually need to be kept separate: The law that is legal and is meant to be normative, and the law of nature that is to be understood descriptively.

H. F. The two do have something in common and that is their compulsory structure. You think that a person or nature has to act *according to this law*. All I have to do is hear the word *law* and I automatically see a prison – and I feel like running away. But be that as it may, I'd like to ask what it means when a person doesn't obey the law. What happens when somebody steals an apple? What happens when the suspected apple thief explains that he or she only wanted to borrow the apple and was planning to bring it back any time? Whose story counts? Don't you have to change the law that is so obviously ill-suited for this type of behavior?

B. P. But there is still a fundamental difference between descriptive and prescriptive laws. Of course an apple is stolen once in a

while – despite the fact that this may be against the law. But laws of nature, like the law of gravity, have universal validity. An apple always falls down. It never falls up.

H. F. How do you know? According to Newton's law, the planet Mercury does not obey the law. I would like to pose the question again: Who should be punished? What needs to be changed? To put it in a nutshell, I strongly believe that we should change the laws when phenomena and types of behavior are observed that do not fit them. Then we need to invent other laws.

B. P. That sounds terrible. If you do it like that, every law that prohibits a crime can be thrown out when the crime occurs – and for that reason, the law is inappropriate and unsuitable for human beings.

H. F. Yes, that's correct. But I'm suggesting something else, and that is to look at the entire problem from a different perspective, and that would relativize the simplistic notion that we have to take laws for granted. I'd like to shake up our belief in their absolute validity. Keep in mind that there was a time in my life when the laws were so incredibly ridiculous that you just had to say, "These disgusting laws have got to go. They have nothing to do with human togetherness. The lawmakers should be locked up!"

B. P. You mean when the Nazis were in power?

H. F. Yes. At that time I asked myself, "Who invented this law that legalizes the murder of human beings? Who is responsible for this outrageous madness that we have to oppose?" What I want to make clear is that every law is an invention that has been created by us and can be changed by us. The change in perspective that I have already mentioned allows the authors of laws to appear front and center, and to ask themselves whether the rules they have invented have a positive influence on a social structure in which they permit us to live and work together in a creative and friendly way.

B. P. I'm beginning to understand you. For you it is a matter of putting the spotlight on people who speak about a law. And you

intend to take their statements and place them all in their area of responsibility.

H. F. That's a good interpretation. You just have to be aware of the fact that every notion of a law includes an inhibitory element. It allows only one view of things, only one possible way, only one type of behavior that is correct and permissible. When you see a law as an invention, there is a moment at which you stop seeing the people who are accused of misbehaving and start considering the inventor, the person who drew up the law in the first place. In so doing, this person moves to the center of the perception and assumes responsibility for his or her statements. And then, because the law may not be compatible with observed phenomena or our ideas of humaneness, the opportunity arises to change this law.

B. P. On the other hand, I'm not quite sure that I like the term "invention" in this context. When you talk about "invented laws of nature", from an epistemological point of view you believe that the emphasis is being placed on the fact that the law is missing a link to reality. Yet it seems that what is important to you is the ethical dimension and the responsibility of the inventor.

H. F. You're right, I'm not an anti-realist. What I would like to point out is that you can hide behind the purported reality of a law and can become the mouthpiece for what it is and should be. The wording of a law that clearly identifies the responsibility would have to be as follows: "It is the way you say it is," rather than, "I'm saying this because it is the way it is." But at this point in our discussion of laws and laws of nature, do you mind if we return to the explanatory principles and the idea of causality? I'd like to remind you that I consider explanations to be the result of making a semantic link between two observations. Ever since Aristotle we have known that the main explanatory principle of our culture – the notion of causality – can appear in different variations, each of which gives rise to another relationship between two descriptions. These include the *causa finalis* and the *causa efficiens*. The causa efficiens is particularly popular. You assume a cause in the past that – in accordance with a transformational rule – gives rise to an effect in the future. You hold something in your hand, open your hand and it falls down – in ac-

cordance with the law of gravity. The cause is preceded by the effect, as it were. The causa finalis describes an effect that one strives to bring about in the future that triggers off an action in the present. The cause in this scenario has its effect in the future. One example of this causal principle is jogging, which is so popular in our century that most likely Aristotle had an inkling of it. You run and run in order to be particularly fit and healthy at some point in the distant future. The cause for one's activity in the present is situated in the future. It is important to keep in mind that the causa efficiens and the causa finalis have the very same triadic structure, with one or the other form chosen for a particular situation. You can see that it is modeled on deductive reasoning. This is where Aristotle took it from.

Why Socrates had to die

B. P. What does the similarity between the structure of a causal explanation and deductive reasoning look like?

H. F. Deductive reasoning uses the syllogism to reach a conclusion. It is a method of thinking that serves to produce seemingly irrefutable statements. A syllogism is a three-part argument. It contains a major premise, a minor premise and a conclusion. We can use the following well-known, classic example to illustrate the use of the syllogism. The major premise is *All men are mortal.* The minor premise is *Socrates is a man.* The conclusion, which is absolutely necessary, is *Socrates is mortal.*

B. P. What are you getting at? Are you trying to show that there is some sort of parallelism between causal explanations and the syllogism?

H. F. Aristotle modeled the causal explanation on syllogistic structure. They are related thinking patterns. What is important to me is the fact that we need to question the major premise of the syllogism, whatever it may be. For example, is Socrates' mortality a property of that philosopher or is it a property of the syllogism? Because if I assume that the above-mentioned major premise is true, then when I insert poor old Socrates into the syllogistic machine, he will come out as a corpse. It you accept the premises in this form, there is no way out.

B. P. You're not trying to say that you doubt that all people are mortal, are you?

H. F. Well, we don't know whether all human beings die or not. Keep in mind that in the history of the world there have been some 80 billion people, of whom about 6 billion are still alive today. That means that some eight percent of all human beings have not yet died. In order to be absolutely sure that we are actually mortal, you'd have to wait until the last person died. And after all, there is a certain probability that a few people are actually immortal. Of course, one way of ensuring that the major premise is correct would be to kill them. But they continue to be rather alive. Do you understand what I'm getting at?

B. P. No, not at all.

H. F. What I mean is that the fundamental premise, which has to do with the mortality of all human beings, doesn't have anything to do with people who are alive. It is nothing other than a statement that is linked to a second statement, and as a result, if you follow the rules, inevitably leads to the death of poor old Socrates, who just happens to be a human being. The conclusion that emerges here is nothing other than the appeal of a certain regularity that does not represent the actual conditions of the world.

B. P. It seems that you feel as though the syllogistic structure is a kind of straitjacket that you would like to get rid of. But I don't quite understand what the point of this type of fundamental doubt is supposed to be.

H. F. The problem is that it is a mistake to believe that these logical deductions, according to which the explanations are formed, have some kind of universal and permanent validity. You have to agree that a premise is true in order to construct this absolute certainty. You play a grammatical game with predetermined results. No, I propose that we should always carefully scrutinize the premises themselves.

B. P. But what's so bad about causal principles and syllogistic structures? After all, they play an important role in our everyday behavior

and in the way we see the world and guide us. They provide an element of stability and reliability. We act in a certain way in order to achieve something and do something in order to produce a certain effect. We have a tendency to interpret our own life story using these types of causal ideas, for instance, attributing a current problem to a bad childhood (psychoanalysis), viewing a behavior that is understood as an effect of the result of a certain causal stimulus (behaviorism), and understanding ourselves – in accordance with a political and ideological model for the perception of the world – as determined by material circumstances (Marxism). What does a life look like that does not submit to the constructed reliability of causal explanations – as you would put it?

H. F. It is quite amusing and full of surprises. It is a rich life, in which you decide how to act from moment to moment. You accept a premise or you don't accept it. You can approach your fellow human beings by crowing that they will all die and that they need to think about death. Or you can also get closer to your fellow human beings, who are all still alive, in order to celebrate the fact that you are all alive together. Accepting a premise means deciding for a certain, different world. And it is up to us to allow this world to emerge.

B. P. What type of approaches that are not based on linear notions of causality could become important?

H. F. Think of the parable, the analogy, or the anecdote. These are all explanatory principles that have unfortunately been pushed aside by the notion of causality, which has invaded like a cancer. Jesus never used the idea of causality to lend authority to his words. He spoke in pictures. He didn't construct a causal relationship between a camel that doesn't pass through the eye of a needle and a rich man. Instead, he used analogies, parables, and stories. And the people understood what he was talking about. The problem is that the notion of causality has an incredible influence that shapes us socially, and it has the power to hide other forms and possibilities to see oneself and the world. People today have no doubt about the link between cause and effect. To me, that seems to be an awfully trivial idea of the relationships in the world. Because not everything

can be explained and attributed to the notion of causality. There are surprises, miracles, and astounding events around us.

Trivial and nontrivial machines

B. P. So you think that it is wrong to believe that everything can be explained by a causal explanation?

H. F. The precondition for speaking about a cause and effect relationship is that the rule of transformation is known. You have to know what makes the *causa* (the cause) become the effect. Yet it is clear that if this information is not available to you it simply doesn't make sense to talk about causality. In my opinion, we are then dealing with a special kind of machine. It is nontrivial, that is, not a trivial machine.

B. P. What are trivial and nontrivial machines? And what do they have to do with causal explanations?

H. F. Distinguishing between trivial and nontrivial machines offers us the possibility to actually bring home the sort of shallow thinking the notion of causality has brought about. The trivial machine is all the rage among the followers of the notion of causality. In order to describe it in more detail, we have to distinguish between a cause or an input, a rule of transformation, and an effect or an output (cf. Fig. 2). You need to imagine a group of events that we can denote with A, B, C, and D and with the numbers 1, 2, 3, 4. In the case of a trivial machine, we will see that there is a regular relationship between these events. That means that following a predetermined rule, the machine takes a stimulus, a cause, or an input and produces a corresponding response, effect, or output, reliably and flawlessly. For example, you give the machine an A and it outputs a 1. Give it a B, and it will output event 2. The trivial machine constantly delivers us a certain output. It remains this way without ever changing.

B. P. The trivial machine is predictable.

H. F. There is an unconditional and unchangeable relation between input and output. The trivial machine is extremely reliable. Its inter-

nal states constantly stay the same. It is independent of the past, and can be synthetically and analytically determined. We can find out what its transfer function is, should we by chance forget it for some reason, by doing simple input and output experiments. The analytical experiment is trivial. And that is why it is so popular. In my opinion, our Western culture has fallen head over heels in love with this type of machine. It is the epitome of our yearning for certainty and security. When we buy a car, we demand a trivialization guarantee. We want the car to conduct itself in a constantly predictable manner, at least for the length of the warranty. And if this is not the case, we bring it back to a trivializer, who retrivializes our car.

B. P. But changing a car that doesn't work any more into a trivial machine makes a lot of sense and might even be a matter of life or death.

H. F. That's correct, but there are all kinds of less sensible attempts to change nature, our fellow human beings, and our environment into trivial machines. Just think of the way our society deals with children who – horror of horrors – happen to behave in a nontrivial way. You ask a child, "How much is two times two". And she answers, "Green!" That type of answer is unpredictable in an ingenious way, yet we consider it to be prohibited. It violates our yearning for certainty and predictability. This child has not yet become a predictable citizen and perhaps there will be a time when she won't even obey our laws. The result is that we send her to a trivialization institution, which we refer to as "school" in official terms. This is how we change this child, step by step, into a trivial machine that always answers our question "What is two times two" the same way.

B. P. How can nontrivial machines be determined?

H. F. These are rather tricky devices, because they have something like an internal state (cf. Fig. 4). Nontrivial machines are always changing their internal structure and their rules of transformation. Let's once again imagine a group of possible inputs and events (A, B, C, and D) and a group of potential results (1, 2, 3, and 4). Again a simple experiment can be performed. For instance, you might input the letter A, and the machine will output the number 1. Then you

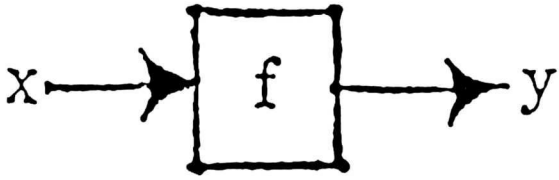
repeat the procedure, and this time the number 4 is output. You input an A again, and a 1 is output, but when you input an A again this time it outputs another result. What is going on? This type of nontrivial machine cannot be analytically determined, because it is always varying the rule of transformation. If we knew the rule that changed the rules of transformation, we could decode the nontrivial machine and understand it. But if we don't know it, it becomes difficult and, as can be observed, impossible to predict the output of this nontrivial machine. For instance, it has been shown that the number of possible nontrivial anagrams that operate with an alphabet consisting of only four letters greatly exceeds the age of the world when measured in microseconds. The experiment of the analysis is nontrivial and the analytical problem unsolvable.

B. P. What is the analytical problem?

H. F. We have before us a system, a machine, or a living being. And the analytical problem is as follows: How does this system, this machine, or this living being function? And can you use a finite series of experiments to determine the operative properties that can be read using the relationship of stimulus and reaction and cause and effect? Can the rule of transformation be identified? In the case of nontrivial machines the analytical problem is in principle unsolvable. I have already mentioned this. Their rules of transformation are dependent on history and the past. They are completely unpredictable – and that is what makes them so incredibly unpopular. They destroy our dream of a predictable world.

B. P. Can you give an example? Who or what is a nontrivial machine?

H. F. In my opinion, we are always surrounded by nontrivial machines everywhere we look. Sometimes we manage to trivialize something for a period of time, until everything explodes in our face. The past always plays a role and has an impact on the rules of transformation. And even the most expensive car will break down sometime – and in so doing demonstrates a behavior that is dependent on the past. The way I see it, the entire world is a nontrivial machine.

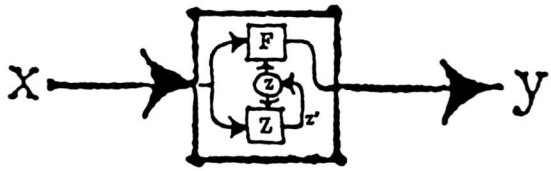


x	y
A	1
B	2
C	3
D	4

Fig. 2 The trivial machine. It is synthetically determined, independent of its history, analytically determined and predictable.

x	f	y
Input	Operation	Output
Independent variable	Function	Dependent variable
Cause	Law of nature	Effect
Minor premise	Major premise	Conclusion
Stimulus	Organism	Response
Motivation	Character	Deeds
Goal	System	Behavior
...	...	...
.	.	.

Fig. 3 The notion of causality has a triadic structure.



In state I

x	y	z'
A	1	I
B	2	II
C	3	I
D	4	II

In state II

x	y	z'
A	4	I
B	3	I
C	2	II
D	1	II

Fig. 4 The nontrivial machine with an inner state z. It is synthetically determined, dependent on its history, cannot be analytically determined, and is unpredictable.

B. P. I get a funny feeling when you refer to the world and its inhabitants as "nontrivial machines". You'll undoubtedly identify this feeling of discomfort as the typical prejudice of a person who has been raised on a steady diet of the liberal arts. But don't you think that applying the machine metaphor to a living being is the first step toward trivialization?

H. F. No, I don't think that at all. The description that I am proposing here in fact demonstrates that you can't trivialize people, living organisms, the world, or objects. The notion of the machine is just something I use to conveniently talk about entrance and exit, input and output, stimulus and response or, to put it mathematically and neutrally, to talk about dependent and independent variables. We all refer to this type of abstract formalism in an indirect way when we talk about laws of nature, cause and effect or, as the psychologists love to do, about a *character*. A character often appears as this type of purportedly permanent rule of transformation. In psychology, it plays the role of the law of nature. A person is stimulated and his or her so-called character determines his or her response. The person has to act in a certain manner and is viewed as a trivial machine.

B. P. But I object to the fact that just mentioning the word machine always gives rise to the suggestion of predictability and transparency. The machine metaphor has this connotation, suggesting that all aspects of human life can be unraveled.

H. F. Okay, I admit that the term "machine" has always made people think of a trivial machine. I'm not 100 percent convinced that this is the ultimate in vocabulary on this subject. So all I can do is to invite you to lay aside your prejudices against the word "machine" for a moment. The advantage of the notion of the machine, if you follow me, is that you can get rid of the idea once and for all that living systems can be trivialized. The term "machine" represents an abstract framework for speaking about input and output relationships and rules of transformation. The formalism that I am proposing here serves to argue in a disciplined manner and provides exact evidence that man and the universe cannot be trivialized and that the analytical problem cannot be solved. But what we are in fact talking about here is the contrast between triviality and nontriviality.

The interaction of nontrivial machines

B. P. If I continue with the assumption that a person is a nontrivial machine, then the surprise becomes a continuum and basic unpredictability becomes normal. From this point of view, the person appears to be a being of choices whose responses and types of behavior are unpredictable by their very nature. It could always be different, and something that happens completely out of the blue could always be on the verge of happening. But that doesn't happen. The assumption of unpredictability by its very nature is counter to our everyday observation and experience. We don't misunderstand each other constantly, we meet at times that we have set ourselves and we can make arrangements for the future. There are a number of conventionalized types of behavior that are absolutely predictable and that allow people to develop relationships with each other in a predictable way. This being the case, how is it that nontrivial machines – people – can interact with each other in a manner that is in fact predictable?

H. F. Now that is a vital step in our considerations, which, however, necessitates the explanation of a further term, which is re-

ferred to as *organizational closure*. What I mean by closure is closed, autonomous, related to oneself, with the beginning and end overlapping. When a nontrivial machine reuses what it has produced or has created an output as input, a circular figure is created. And when this circularity is produced and the machine has been in operation for a while, something very interesting takes place. Stable values emerge.

B. P. Could you use an example to illustrate this production of stability that takes place within the system?

H. F. Okay. Let's say I take a pocket calculator and enter a number of your choice. I take the square root of this number, and when the calculator has come up with it I press on the square root button again. In so doing, a circular process evolves. The output becomes the input and the result of an operation is used as the starting point of the same operation, the result of which in turn serves as the starting point of this operation. After a certain period of time and the continuous use of the operation of the square root, a so-called *eigenvalue* emerges. In this particular case it is the number 1. And the square root of one is one. You can determine that a stable value has emerged, and while you can't explain how it came to be, you are able to predict it. In mathematics this is referred to as an eigenvalue (from the German word *Eigenwert*).

B. P. What do these mathematical explanations have to do with my theory that there is a contradiction between the predictable behavior of nontrivial machines and your assumption that they do not act predictably by their very nature? How does pointing out that there is such a thing as eigenvalues serve as an explanation?

H. F. We talk together, we make dates with each other, we make plans together. In this interaction the different participants – or nontrivial machines – constitute an organized closed system, which results from the reciprocal effect of all of the participants on each other. They respond to each other, pick up on the actions of the others, stimulate and respond. And in so doing, we can establish how stable behavior comes about, against the backdrop of the basic nontriviality of the participants, who in turn constitute a nontrivial

network or system together. We can make predictions, but we cannot explain how it comes about. At this point we can widen the scope, pull it away from the interaction of a few participants and extend it to entire societies or cultures. The entire social structure can be understood as a closed operator that allows certain stable values and predictable forms of interaction to emerge out of the infinite possibilities for behavior. They unfold from the infinite spectrum of possibilities and are inexplicable from an analytical point of view. Yet they can be predicted from the perspective of what can be experienced. Eigenvalues or eigenbehavior and stable forms of interaction all emerge. In line with this, we can see the language, customs, and traditions of a culture as the "eigenlanguage", the "eigencustoms", and the "eigentraditions" of this culture, which is a culture in which we ourselves are incorporated.

B. P. How can something like language be characterized as an eigenvalue of the social process or as an "eigenlanguage"?

H. F. When people in our culture use the little word *and*, we know exactly what they mean. We haven't got a clue as to how we know what they mean. We use language as though we could explain how a certain meaning can be gathered from a person's bizarre hisses and grunts. Yet we cannot explain how this takes place. We only know what it means when people say *and* and we use the word in the same way. Language can be understood as the behavior of reciprocally operating nontrivial systems. Certain stable elements develop and the behavior converges toward a certain value. It becomes stable in French, Italian, English, or German. On the other hand, perturbations of the system can also be observed. Other people who do not yet belong to the closed system enter it. They speak differently and may have a different accent or speak a regional dialect. This may result in a shift and a modification of the closed system, which is then enriched by new words and other dialects. The external perturbation is integrated recursively.

B. P. At this point it might be a good idea to make these thoughts somewhat more concrete by returning to the notion of the miracle that was the starting point of our conversation and which led us to the discussion of trivial and nontrivial machines. I hope that the

change in subject isn't too abrupt. You mentioned that you see the encounter between people and mutual understanding as a miracle that is permanently taking place but which is impossible to explain. You might say that this justifies a whole new attitude of humility toward the fact that the world's structure resists being dissected and understood by us.

H. F. In fact, I'm touched by your association with the notion of the miracle and am in complete agreement. Of course there is a connection between the notion of the miracle and the fundamental inexplicability of functioning interactions. The miracle cannot be explained. In fact, in attempting to explain it one often tries to push it aside or even destroy it. It would be great if people could warm up to the concept of not knowing. I would go so far as to propose that we allow miracles to come about by not attempting to explain some phenomena in the first place, because in a deeper sense, we are simply not in a position to do so. It seems to me that our knowledge of the world is just the tip of the iceberg. It is like the tiny bit of ice that juts out of the water, while that which we do not know extends down to the vast depths of the ocean.

B. P. Yet when we do broach the topic of "wonder" and our awe of the unknown, it tends to be in a more poetic form. You, however, have chosen a method of describing this that is more or less in direct contrast to this. Your language has been honed according to the ideals of mathematical precision.

H. F. The way I see it, "wonder" can be provided with a solid foundation if you describe it using strict logic and very precise formalisms. Using the formalism and the thoughts that may at first sight appear to be difficult and abstract serves to reach the people who claim that they have understood everything. My objective is to cast doubt on what people believe is the comprehensive validity of explanations, to shake it up in a justifiable manner. If I were able to make the feeling for the miracles that we are constantly encountering reappear, I'd be a very happy man indeed.

B. P. One last question. What is a miracle?

S. F. If memory serves me correctly, Socrates was once asked this same question. A burning candle was on a table. Socrates pointed to the candle and said, "That burning candle over there is a miracle." I tend to agree with Socrates. Everything is a miracle.

II. Perspectives in Practice

1. Teaching

The pupil as a nontrivial machine

B. P. This is a good point to discuss a few of the concrete applications that reveal the practical uses of your thinking. Perhaps we could begin with questions that have to do with teaching, either directly or indirectly. You once came up with a statement that shows that your notions can be used to assess society. It goes as follows: "The majority of our institutionalized teaching efforts have the objective of trivializing our children."

H. F. Many people are of the opinion that the awful thing about children is that they do not behave in a predictable manner. They don't act like trivial machines that always generate the same output when a particular input is entered. Since our education system is set up to produce predictable citizens, its purpose is to eliminate those annoying inner states that allow unpredictability and creativity. It is often the case in school that a question has only one answer. You simply cannot say that two times two is "green", as I have already mentioned. And yet if you think about it, it is a fantastic thought that could give rise to the question, "Why has this child answered, 'Green'? What kind of ideas does he or she have?" And I assume that this child would tell me something that is extraordinarily wonderful or funny.

B. P. So you want to discount the idea that there is only one right answer and instead push the idea that there is a whole range of possible answers?

H. F. Of course. I still break into a smile when I think back to our high school, where we had a history teacher who only accepted one answer for the question, "What kind of people were the Greeks?" And the answer was – "A merry people." If you didn't know that and said that the Greeks were a philosophical, a lyrical, or an athletically interesting people, you failed. The only thing that was allowed was responding to the teacher's question with the same, monotonous output, "*Herr Lehrer*, the Greeks were a merry people!"

B. P. These attempts at trivialization are relatively harmless. It is easy to see how stupid they are.

H. F. I can give you countless other examples that are anything but harmless. They are horrible and heart-wrenching. Shall I tell you a little story? I was once invited to lunch at the home of some friends of ours. Their little boy, who was supposed to have come from school, didn't turn up for what seemed like ages. Finally he did show up, but he was crying and said, "I had to stay after school! The teacher made me stand in the corner!" We of course wanted to know what had happened. The boy told us that the teacher had said that he had been rude, that his answers had been rude. He said, "She asked me what 2 x 3 is and I told her, it's 3 x 2! Everybody started laughing – and the teacher made me stand in the corner." I asked the little boy, "Your answer is exactly right, but can you prove that it is right?" And then he took a paper and pencil and drew two dots, and right above them, three dots. He said, "That is 3 x 2!" And then he turned the paper 90 degrees and said, "See Heinz, that is 2 x 3!" This little boy, who was all of seven years old, had proved the commutative law of multiplication in his own way: A x B is B x A. The fact that the teacher was not able to see how ingenious this insight was is a tragedy. She had expected him to say "six" when asked what the product of 2 x 3 was. Since he didn't say that, his answer appeared to be false, rude, and even rebellious. That is what I call the trivialization of young people.

B. P. The logical conclusion is that every teacher must reckon with the basic nontriviality of his or her pupils.

H. F. Of course. And once the trivilization process has been successfully completed, the advanced teaching task is "detrivialization", which means pointing out other possible answers and encouraging pupils to come up with a variety of solutions and perspectives. For example, you could show this little boy that a number can be described in a multitude of different ways. Once the teacher has culled the desired answer from him – "six" – she can now start asking, "What is six?" Possible answers include "Six is the square root of 36, six is 5 + 1 and 8 – 2, 6 is 2 x 3 and 3 x 2."

B. P. I'd like to pick up on a suggestion that Neil Postman, an educator and media critic, once made. The spectrum of perspectives could also be underscored by making a point of teaching even the hard sciences as historical disciplines in order to have these experiences of distinction, and to show that the same or similar questions have already been dealt with in very different ways throughout the course of history. To give a concrete example, if you talk about atoms in school, then you would also mention Democritus. When you discuss electricity, you connect it to the name Faraday. When you cover optical phenomena, you link them to the historical ideas of sight and vision that go back to ancient times, and so on. Neil Postman's strict recommendation is to teach every subject as history. Of course, it is difficult to give tests if you allow a whole range of answers. How are you supposed to figure out what pupils know?

"Tests test tests"

H. F. The conventional method, of course, is to have them take tests, and to assign them homework that is collected and marked. But that doesn't quite work. I am convinced that you can never know what pupils know. Since they are nontrivial systems, they must be considered to be analytically inaccessible. I think that all these tests and exams don't actually test the pupils, but that the tests test themselves. My thesis on this point is *"Tests test tests"*.

B. P. I don't quite understand this slogan. Now what I can follow is the conventional assumption, which is *"Tests test those being tested"*.

H. F. Okay, to spell this all out for you, I'm going to use an example that was invented by one of the most ingenious mathematicians

of the twentieth century, Alan Turing, who felt compelled to resolve the following questions: Can machines think? Is there artificial intelligence? In his quest for an answer he created the so-called Turing Test, which became very well known. I see it as the original paradigm for a test and it is still held in awe by followers of Artificial Intelligence. What does it consist of? Well, imagine this. There is a little theater with a red velvet curtain. And something is hiding behind the curtain that has not been identified. Several scholars are sitting in front of the curtain, and they have pince-nez, glasses, and long beards. The scholars are now permitted to ask this thing, this entity, a few questions. After a while they decide whether the thing behind the curtain is a machine or a human being, or whether the question is undecidable.

B. P. So, if on the basis of the answers they decide that the thing behind the curtain is a human being, but it turns out to be a machine, this proves that the machine is intelligent.

H. F. Exactly, that's the idea. But the way I see it, and now I'm returning to my thesis, the potential intelligence of the machine is not being tested. In actual fact, the scholars are testing themselves. Yes, they are testing themselves to determine whether or not they can tell a human being from a machine. And if they don't manage to do this, they will have failed. The way I see it, the examiners are examining themselves, not the entity that is meekly sitting behind the curtain and providing answers for their questions. As I said, "*Tests test tests.*"

B. P. Well, then in terms of this, what is the "good report card" that a pupil gets?

H. F. A good report card is evidence of successful trivialization. If you actually consistently give the right answers – click, click, click – you get good or even excellent grades. That's the long and the short of it. One of my students, who was a computer scientist, once came up with a program that gave us a lot of laughs. It could be used to write master's and doctoral theses. It took the respective professor's favorite words and key expressions that were to be written down during his lectures, and constructed any number of well-formed

sentences. If you used this program, you were bound to get a super grade. That's the gimmick.

B. P. You have held a number of lectures at European and American meetings on education that deal with reforming teaching and the schools. Why do you think that you were asked to speak at these particular venues? After all, you are a cybernetician and physicist whose primary area of activity has been research rather than teaching.

H. F. The first educators to invite me to speak were familiar with my work on cognition and perception theory. They thought that it might be a good idea to address the topic of learning, rather than teaching, for a change. Their assumption was that focusing on learning was vital to improving and rethinking their conceptions of education. In other words, we have to learn to learn in order to teach someone something that we consider to be important for them.

B. P. But your work has always completely disagreed with the fundamental pedagogical premise of *transmitting knowledge*. You have always emphasized our *fundamental ignorance*.

H. F. Teachers generally assume that they know everything and the children they teach know nothing. Along these lines, learning is the step-by-step elimination of ignorance. You change a poor state into a better one, transforming an ignorant person into a knowledgeable one, operating like an alchemist who turns iron into gold. If you take this old metaphor of a step-by-step alchemistic transformation as your starting point, you will perceive your pupils as some sort of cheap material that has to be converted to a better, more precious and more valuable one by being led through various levels.

B. P. And the magic potion is knowledge?

H. F. Right, that's the accepted notion. But I wouldn't touch the idea of the transmission of knowledge with a 10-foot pole! You can't transmit knowledge. It can't be conceived of as a sort of object or thing that you can transfer from A to B, as you can do with sugar or cigarettes or coffee, in order to generate a certain effect in an organism. No, the way I see it, knowledge is generated by people them-

selves. The key factor here is providing conditions that allow these processes of generation and creation to take place. The picture of this type of learner is quite different from that of the other one. They cease to be passive. They are not an empty box or a container that some state-approved authority (a teacher, or a great, wise professor) fills with fact and dates and his or her enormous wisdom. If you take a moment and ask how learning takes place, the ideas that Humberto Maturana, Gordon Pask, myself, and a few others have put forth become very interesting for creating new pedagogical concepts. From this sort of cognition and perception theoretical perspective learners appear as active constructors. They are the ones that have created their knowledge.

B. P. The slogan *"From teaching to the learner"* bids farewell to an educational culture that is authoritarian, hierarchical, and static. Knowledge is no longer seen as some entity being transported through a medium – language – from a teacher to a pupil who is a passive recipient, gulping down information.

H. F. Yes, exactly. Those educators and teachers who asked me to speak on many different occasions asked these kinds of questions: "What about our students? What's happening? What are these young people perceiving? How do they experience a typical class?" I think it is extremely encouraging to see that it is becoming increasingly frequent for us to seriously view our pupils as people who learn, perceive, and *cognize*. Teaching metaphors have included such things as the image of the Nuremberg funnel, which depicted an open head with knowledge being poured into it through a funnel. It evolved in the seventeenth century and described the learning process as a passive intake of information. Thank goodness they are being replaced by other concepts and ideas. We are getting away from the key role of the desires of the teacher and turning toward the opportunities that the students have to use and expand on the material they are exposed to.

B. P. So what happens to the teacher in this scenario?

H. F. Well, I would propose that teachers abandon the idea that they know everything and their students know nothing and are peo-

ple whose heads need to be filled with their teachers' ideas. It would be good if teachers would surrender their position of superiority and the class could be made aware of the fact that there are a few things that their teachers don't know either. Teachers should assume the attitude of Socratic ignorance, on which the statement "I know that I know nothing" is based. In my opinion, this is a much more progressive attitude than that of a person who believes in fundamental ignorance, whose slogan is "You don't know yet that you don't know anything." So what do you do if you are a Socratic ignoramus? What do you do when you know that you don't know anything? The answer is, you begin to do research.

From teacher to researcher

B. P. So the teacher becomes a researcher?

H. F. That is exactly what I am proposing. Turn the teacher who is *supposed* to know into a researcher who is *eager* to know! And if you continue along these lines, the so-called pupils and teachers become collaborators who create knowledge together starting from a question that is fascinating to both of them. The way I see it, an atmosphere of cooperation, a common search – yes, research – comes about. You arouse one's curiosity and empathy, encourage one's own thoughts, not serving up some finished results but rather questions that become the starting point for cooperation and mutual delight. Each person is dependent on the other person's skills and knowledge. An end is put to the groveling in front of the omniscience of one single person. And the questions that one is confronted with become one's own questions. My friend Gordon Pask once reassigned the roles in the teacher-student relationship in an even more radical way. He suggested completely changing roles. The teachers become the students and vice versa. Now you can pose the question as to what the students teach. The answer is that they point out the teachers' own idiosyncrasies, make the teachers aware of their bias, and demonstrate and teach them how they have become accustomed to viewing the world, their surroundings, and the people around them. According to Pask, teachers have to learn what it is that is preventing students from understanding them and from comprehending their ideas, which may have to do with physics, geography, or math.

B. P. What does that mean from a practical point of view? If a teacher enters a classroom and suddenly starts talking about his or her unfortunate lack of knowledge of something in order to pique the students' interest in the subject, they might get the impression that something is fishy, and that it is only being staged, some gimmick that some bit player might come up with.

H. F. The ignorance on the part of teachers is not something that needs to be performed. It's already there! Teachers have no idea what students know, what they are able to do, what they are interested in, and where their special abilities and talents that need to be encouraged lie. Teachers don't even know how they themselves learn. And from this perspective, they are only being perfectly honest when they get up in front of the class and begin a dialog as follows: "Dear class attendees, dear girls and boys. We have gathered together to invent mathematics together. Is it possible for us to create a numeric system together that operates according to certain rules? Are numbers finite or infinite? Can we prove certain theorems, such as the Pythagorean theorem, using our own means? So, who has an idea?"

B. P. Yet it appears that there are some teachers out there who do not find this new definition of their role very attractive. In Germany, for instance, there was a large-scale survey on the interpretation of literary texts. Results of hundreds of interviews showed that the dogma of the one, the only, and the true meaning of a text is simply untenable from an empirical point of view. This should have been the impetus for changing the way literature is taught in the schools, which often involves working toward the one and only correct interpretation of a poem, which has been determined at the outset, day in and day out. Yet the results of an attempt to use the survey results to develop a new method demonstrated that schools and teachers are simply not interested in modifying their tried and true methods of literary analysis. One reason for this may be that they are afraid of losing their status and power if they relinquish their authority as the almighty literary interpreter. The question is, how can you keep teachers from being afraid that they will surrender their power and from their feelings of uncertainty, both of which are induced by your proposals?

H. F. There is only one solution to that. You have to show them that questions that cannot be answered and those that have more than one solution are actually things that should be welcomed from their point of view. Let's say that we're having a discussion about the murder of Caesar in an upper-level class and a student wants to know what political configurations in ancient Rome may have led to this murder. And let's assume that the teacher doesn't know the answer. At this point, there are two possibilities. Either the teacher becomes unsure of herself and snaps at the student or she interprets the situation as an invitation to work together. Perhaps one or two members of the class would like to go to the library and do a short presentation on the topic in a few days. This is a wonderful opportunity for the teacher herself to learn something new.

B. P. But for the most part, classroom teaching consists of testing things that are already known.

H. F. It's much worse than that. The majority of the time in the classroom is spent asking illegitimate questions and demanding answers for them. According to my definition, a question is illegitimate when its answer is already known. When teachers pose this type of question, it is nasty and downright mean, because they already know the answers. On the other hand, legitimate questions are genuine questions. There are no instant answers to legitimate questions. Wouldn't it be great if an institution like the school would make the answering of legitimate questions its major priority?

Outline of an experiment

B. P. But setting up this type of instruction would probably be quite time-consuming, and there just isn't that much time available in the typical curriculum. I can imagine that a lot of teachers would be afraid that if they were to base their teaching on these types of premises, the children wouldn't manage to learn enough of what they are supposed to be learning.

H. F. My own experiments and the experience that I had as someone who only spent a fraction of his time doing university teaching and most of his time in research had quite the opposite outcome.

The attempt to interpret learning as a joint research venture had absolutely astounding results.

B. P. Would you like to give an example of this?

H. F. Sure. I'd like to tell a story that begins in the year 1968 at the campus of the University of Illinois. I was the head of a research laboratory at that point. And every year, just before the start of the summer break, the students always had a big celebration and turned the entire campus into a huge amusement park. There were booths with jugglers, people who played and sang, a group who performed dancing, and some performances by an escape artist. My friend and colleague Herbert Brün, director of the computer music studio, and I always saw this celebration as an opportunity to scout around for talented students with whom it would be fun and productive to work. And as Herbert and I went walking around the campus that summer in 1968, we were approached by a tall, good-looking man who proceeded to grab me by the lapels and ask, "Would you teach a class about heuristics?" And I answered, "What do you mean by heuristics? Are you thinking of a strategy for solving mathematical problems? Or do you see heuristics as a method of instruction that provides the students with the opportunity to come up with the solution to the problem themselves?" The young man hesitated a moment, since he had obviously never heard about this distinction before, and cleverly answered, "Both!" And then I asked Herbert if he would like to teach that kind of class with me. He agreed, and so we taught the class, which began in September 1968 and concluded in May 1974 with the publication of a book that is entitled *Cybernetics of Cybernetics* and is exactly 523 pages long.

B. P. What did the class look like? What kind of insights did it yield?

H. F. In the course description we said that there were no prerequisites. That meant that the students came from all kinds of disciplines. When Herbert Brün left the university after about one and a half years and I was able to expand the research project in my lab, I intended to stop teaching the class, but the young people, who were so enthusiastic, talked me into continuing. More than 200 students came to the next class and I decided that since I simply didn't have

the time to invest in class preparation, I would have heuristics become the main activity of the class. We agreed to write a book, and drew up a list of topics of interest, so that people who had common interests could meet. Some students didn't take things very seriously. They put down "sex" and "sleep" as their preferences and hobbies. But we included everything in the list, just as had been agreed on at the outset of the class. And when the list was put into print, some of the students were horrified at their stupid answers and came up to me to apologize. "It's your problem, not mine," I said, and they walked away, completely taken aback. They appeared to have understood lesson one of this class: *You might actually be taken seriously*. Our work together produced the book entitled *The Whole University Catalog*, which dealt with the relationship of the students to their university.

B. P. If I interpret this example from the point of view of a model, several key words occur to me, including *cooperation, (self) responsibility* and *(self) interest*. These are the theoretical parameters of the example that you just presented.

H. F. That's right. And I was so encouraged by the positive results of our work, and with the added incentive that the great anthropologist Margaret Mead had always asked me to do so, I decided to write the "definitive book" on cybernetics. But I decided to do this a bit differently. Instead of writing the book myself, I wanted to involve the students who wanted to know something about cybernetics in the writing and production of the book. And this time we also formed groups according to our interests. Several students took on the task of contacting experts and scholars in order to ask them to provide their definitions of the technical terms. In so doing, they learned that the same term can be defined in very different ways by different scholars. The excitement and enthusiasm that arose from creating something new generated such a euphoric atmosphere that in the end we were able to publish a book, entitled *Cybernetics of Cybernetics*, in May 1974. It has been republished recently in a lovely edition.

2. Psychotherapy

The distinction between sickness and health

B. P. Do you think we could try out your ideas on some questions within the area of psychotherapy? This area, like education, also deals with the processes of implementing change in people. Here, however, it is not a matter of transforming ignorant people into people with knowledge, but rather changing so-called sick people into people who are healthy and normal. What do you think of the strict distinction between sickness and health?

H. F. I'd like to start with an example that was passed on to me by a good friend, family therapist Paul Watzlawick. According to him, there is an important diagnostic handbook in the U.S. entitled DSM *(Diagnostic and Statistical Manual)* that appears in new editions at regular intervals. Until very recently, this book dealt with a sickness that was referred to as homosexuality. In one of the recently revised editions of the book, the editors decided, after years of debate, to stop classifying homosexuality as an illness. And this decision meant that millions of people had been cured with a single blow. Suddenly, homosexuality had ceased to be something that the country's psychiatrists needed to cure.

B. P. It goes without saying that homosexuality cannot be seen as something pathological. That would be discriminatory and downright stupid. But what is the significance of this example if we interpret it from a general point of view? Are you trying to say that it is the diagnostic term that creates the presumed reality?

H. F. More or less. What I wanted to get at with the example was how strongly what we consider to be an illness is shaped by our cultural surroundings. You have to make quite an effort to arrive at new perspectives that push aside our traditional prejudices. And a new perspective can completely change the way we interpret an illness. Here's another example: When anthropologist Gregory Bateson first became interested in schizophrenia, he was visited by two desperate psychiatrists, who reported about a "sick" child. This child was the terror of the school. His behavior was terrible. He threatened the other children, threw inkwells across the room, and terrorized his family.

The two psychiatrists asked Bateson for his help. And he came up with the idea of trying to perceive the child from an ecological perspective, rather than in isolation. He decided to invite everyone who had something to say about the child's behavior. Bateson asked, "Is there anything about this child's behavior that makes sense? Where does it fit?" The child's parents and siblings and one of his teachers all came. After the first session, Bateson told the two psychiatrists, "This boy is the only healthy person in this society! No wonder that he has so desperately tried to escape from his surroundings and environment." The example shows that restricting the questions to the individual, here, the boy, would not have led to this kind of understanding. He would have been pathologized even more than he already had been.

B. P. Adolf Muschg, a Swiss author, once said in a book, "Illness is the healthy reaction of despairing about the norm!"

S. F. This quote fits in very well, because it emphasizes from the perspective of the critic that illness and health are not some kind of static entities but that they have to be assessed within their respective systems of reference. I get quite annoyed by this presumed cut-and-dryness of the words illness, health, and therapy. When you talk about health, when the word therapy arises or the word healing comes up among followers of a *New Age*, the idea of illness is immediately introduced and the other person is implicitly pathologized. This is why I have always suggested to my friends who work as family therapists that they abandon the very word "therapy" and replace it with another word that doesn't imply that the person in question is sick. Perhaps they should refer to themselves as friends of the family who help other people. Who knows whether someone who consults a psychotherapist is sick or not? The only thing that is certain is that this person feels unhappy and is suffering. He or she has come to seek help, not to be cured. And sorrow about one's own state of mind or the state of the world is not necessarily pathological but may even be the sign of mental health. You notice that something is not working and that there is a good reason for your sorrow.

B. P. Your criticism of terminology and your aversion to talking about therapy, health, and healing remind me of the work of the

English logician George Spencer-Brown. In his acclaimed treatise entitled *Laws of Form*, he starts with the assumption that every observation begins with the act of drawing a distinction. If you want to indicate something, you have to first choose a distinction. According to Spencer-Brown, the choice of distinction determines what, if anything, can be observed. When I distinguish between *good* and *bad*, no matter where I look, I can observe something differently than when I use the distinction between *rich* and *poor*, *beautiful* and *ugly*, *new* and *old*, or *sick* and *healthy* as a basis.

H. F. That's a good point. The following statement can be found in George Spencer-Brown's writings: "Draw a distinction and a universe comes into being." He perceived the act of drawing a distinction as a fundamental operation of thinking. It allows an entire universe to evolve and generates realities that one assumes to be in an external space that is separate from one's own self. You could also say that when we discuss these types of questions we are talking about a semantic magic trick. Talking about therapy inevitably magically turns the person in question into someone who is sick and who is in need of my healing activities. For my part, I think that I would try to help someone who is feeling emotional pain to overcome it.

B. P. So if I follow you correctly, the objective of psychotherapy is to replace our notion of reality, which generates suffering, with one that is less painful and sad?

H. F. I think I'd agree with that for the most part, although it's important to keep in mind that times of sadness can be quite important. It's no coincidence that many cultures have periods and rituals of mourning in order to get over the loss of a person or some other terrible event. They are used to ease the seeming intolerability of the suffering, not to forget or repress the suffering itself, however. No, no, you can't forget it, nor should you.

Generating a new eigenbehavior

B. P. From my point of view, the question now arises as to which methods and techniques can be used to make a situation in which someone is suffering more bearable. I have learned from you that we should perceive human beings as nontrivial systems. This way

of looking at things applies tight limits to the concept of directive and linear control and change. You never know how the people in question might react.

H. F. You're right. I do see a person as a nontrivial system. And I also claim that when you put these individual people together, let's say, in a family, they proceed to make a new nontrivial system. When this system is closed (and a family is generally a rather closed system from a cultural and social point of view), a certain eigenbehavior is generated by the reciprocal effects of the people involved, and this behavior may serve to make one or even all of those involved unhappy. The task of a so-called therapist now consists of coaxing these people, who are all interacting there, into bringing about a new eigenbehavior in order to create new initial values and to allow new eigenvalues to arise. It is not the therapist's job to explain this eigenbehavior – she isn't capable of this anyway. It isn't her job to use her clients to test her hypotheses and to falsify therapeutic theories. What is indeed her job is to throw them a few bones (of contention!) in order to get the members of a family to treat each other differently and if possible, to reveal communication patterns that may have been buried over the years. She has to use tricks that allow them to bring about a new and different eigenbehavior. That's what they pay her for.

B. P. What you call "tricks" is what psychotherapists tend to refer to as "non-directive stimuli" and they use labels such as "prescription of symptoms", "paradoxical challenge to act", "provocation", and so on. Which of these tricks do you think has the most potential to liquefy a client's perception of reality that generates suffering and to make it more bearable? How do you generate a new eigenbehavior?

H. F. I have always been particularly impressed by the method of *circular questioning* that was invented by a group of therapists from Milan. It works like this: You go around the circle. A typical family – Dad, Mom, Sister, and Brother – is sitting across from the therapist. The family is having trouble getting along, but the therapist doesn't address the issue. Instead, he asks some rather trivial questions – and suddenly turns to the mother and asks, "What do you think

your daughter thinks about her father?" The woman is completely thrown off. She now has to change her point of view, needs to put herself in the other person's place and suddenly – after all, it's the great and mighty therapist who is asking the question – come up with an answer. Suddenly absolute amazement descends on the family. It is the story of the woman, who is talking about her daughter's ideas, that generates a new reality. From this point on, the other people in the family have to adapt to it. The result is that a new eigenbehavior can emerge.

B. P. Perhaps this is a good point to make a transition to a slightly unrelated topic that is something you have also done a lot of thinking about. The question is what the notion of mental health means from your epistemological perspective. Or let's put it the other way around. Psychiatrists refer to clients who hallucinate and see white mice as "having lost the connection to reality". Their diagnostic terminology is ontologically contaminated because it implicitly assumes a reality that can be recognized objectively and which is obviously accessible to them.

H. F. That reminds me of a little anecdote that has to do with one of psychiatrist Oliver Sacks' magical books. The book is entitled *The Man Who Mistook His Wife for a Hat*. I was holding a lecture for family therapists and when I mentioned Oliver Sacks' book, something funny happened. When I started talking about it, I thought the book was called "The man who took his wife for a hat". The therapists in the audience seemed to be familiar with the book and called out, "Heinz, that's wrong. The book is called *The Man Who Mistook His Wife for a Hat*." "Aha," I replied. "It appears that Sacks missed something vital here." The man Sacks was writing about didn't mix anything up at all. He actually thought his wife was a hat. For him, she was a hat. In fact, in order to make this more clear, the title of the book should actually be "The man who thought his wife was a hat." We still do not know what is happening or who it is that actually sees things correctly. We do not yet have a realistic presupposition as our starting point that forces us to interpret a behavior in a certain way.

B. P. This means that Oliver Sacks interpreted the man's behavior as a realistic epistemologist. He knows reality and his client shows a significant deviation from it. The degree to which the client conforms to reality is the basis for the diagnosis and for determining whether a person is normal and emotionally healthy.

H. F. That's what I'm getting at. Sacks didn't see that the poor guy wasn't mistaken, but rather that he perceived a hat that the psychiatrist believed was his wife. That's exactly how it works with the white mice that a person sees who is having the DTs. The doctor enters the room. The delirious person proceeds to tell him about the white mice who are scurrying up and down the walls, and the doctor says, "But there aren't really any white mice. It's all an illusion, it's all in your head." Well, my response to that is, poor doctor! He doesn't see any white mice. He is completely unable to put himself in the place of this person who needs his help. He has a problem.

B. P. And yet it seems to me that we need to find some kind of language that we can use to distinguish a person who is hallucinating or schizophrenic, for example, from someone who lives in another mental world. I do agree with the epistemological basis of your view that the degree of conformity to reality cannot be the criterion for a diagnosis, but it still needs to be possible to articulate this obvious "difference".

H. F. Well, that calls for another little anecdote. Many years ago, the Mental Research Institute sponsored a huge conference in San Francisco whose motto was, "Maps of the World – and Maps of the Mind." This was a twist on the famous statement uttered by Alfred Korzybski, the founder of General Semantics, who in his tome *Science & Sanity* wrote, "The map is not the territory." This statement, along with a few others, is the basis for diagnosing schizophrenia. We say that the schizophrenics confuse names and things, symbols and objects. They take a bite into the menu that contains the description of the vegetable soup because they think it *is* the vegetable soup. When I held my lecture at this same conference, I started off by proclaiming the theory, "Ladies and gentlemen, the map *is* the territory! We don't have anything besides maps." When we start

distinguishing between an inside and an outside, we are barking up the wrong tree. We only see what we see.

B. P. But how would you talk about this person that we refer to as schizophrenic? I mean, there is an obvious difference between the description of a soup on a menu and the actual soup.

H. F. Yes, that's right. But that doesn't mean that the realistic distinction between map and territory, which has been determined strictly by implicit means, has to stand unchallenged. I'd say, *The map of the map is not the map of the territory.* This allows for a possibility to distinguish between the two worlds that are being conceived of without referring to reality and to a presumed independent external world that serves as the basis for the distinction. Pointing out that the two maps are different is different to talking about the map and the territory.

B. P. If you look at it this way, the notion of mental health is transformed. You stop asking whether schizophrenics deviate from an intensely imagined reality and instead focus on the question as to whether their ideas of reality in comparison to our ideas of reality are pleasant or painful and unpleasant.

H. F. Exactly. We could probably agree on the fact that the menu doesn't taste as good as the vegetable soup. The map of the menu tastes horrible. The map of the vegetable soup tastes pretty good. And if you put it this way, the distinctions that we use to characterize schizophrenics end up on a completely different level. We are now distinguishing between two ideas, and it's not that one is true and the other false, but rather that they are both in our heads.

3. Management

Thus spake the hierarchy ...

B. P. In our travels around the different applications of your theories, I'd like to digress again and leave the terrain of psychotherapy in order to touch on another topic: Management or business administration. I'd like to start by asking you a simple question. What

can managers who head a company and want to motivate their employees, implement their decisions, and increase their profits learn from you?

H. F. I'd like to answer that question by using two Austrian proverbs. The first one goes, "You can even learn something from an idiot," and the second, "Let blockheads die as blockheads". These are lofty statements that should be engraved in the archway to every university alongside the quotations from Aristotle, Socrates, and other great minds.

B. P. What do these proverbs mean for modern management?

H. F. I'd like to use the first proverb to point out to managers that they can learn something from any person who may be working for their company. And this person can also learn something from me, if they want to. The second proverb implies that there are limits to what you can teach someone. That means that it is useless to be become some kind of control freak and think that you can use your authority to transform everybody in a certain way and turn them into a certain type of person.

B. P. Which management concepts do you think we should get rid of altogether?

H. F. One of the traditions of the nineteenth and twentieth centuries was setting up companies and organizations hierarchically. In a hierarchy, in which "the holy one" (from the Greek *hieros*) rules (from the Greek *archein*), the boss has all the power and orders are given from the top down. This type of company set-up emulates the structure of the Catholic church. The pope is the person who has a direct line to the holy one and communicates to the subjects what has been said on high. The concept of a hierarchical structure of orders is based on the Aristotelian notion of an absolute best, a *summum bonum*. The thought behind this is the following: The people at the top know best what needs to be done. On the other hand, it has been shown that this structure of orders is apparently not very effective, because the communication is one-way, and mistakes that are identified at the bottom do not change the behavior of the people at the

top. The people who make up the lower ranks of the hierarchy are simply not heard. There is no possibility for feedback, as we would call it today.

B. P. What should take the place of the authoritarian model of hierarchy in which the subjects have to orient themselves toward the orders of an omniscient boss? What other mode of communication can you suggest?

H. F. Well, the first thing is to let go of the idea of a *summum bonum*. Experiments have shown that when people choose among different possibilities they do not orient themselves toward a certain hierarchy of values that are subordinate to an ultimate *summum bonum*. Their value judgment is not structured logically and hierarchically. For instance, you could ask someone to choose between apples and pears. You ask, "Which fruit would you prefer?" And the person chooses the pear. Thus the pear has the highest value. Or more generally, "B is better than A." Then you ask the same person to choose between pears and lemons, and he or she chooses lemons, meaning that at this point lemons have the highest value: "C is better than B". Finally, you ask the person to choose between an apple and a lemon. If this person had studied logic and is thinking logically, as he or she has been taught, it would have to be the lemon. But in the experiment – to the horror of all the logicians – it is the apple, meaning, "B is better than A, C is better than B, A is better than C." From the two premises "B is better than A" and "C is better than B" you would have to conclude that of the three (A, B, C), C is the best and A is the worst. Be that as it may, what currently appears to be the worst, has apparently been identified as the best in the pairs of contrasts. That's a logician's nightmare! The value judgments that people make are circular. Yet if you follow the traditional theories that are based on a certain hierarchy of values this should not be the case. This type of mode of selection is referred to as a value anomaly. But you could put it this way, that perhaps it is the logic that requires this form of decision and selection that is the actual anomaly – and not human behavior.

B. P. What do these ideas on value anomaly mean for management?

H. F. Hold on a second, please. Before we can clarify this question, it is important to know that the value anomaly was taken seriously by neurophilosopher Warren McCulloch. He was able to explain this phenomenon by linking it to his observations on the structure of the nervous system. In 1943, more than half a century ago, he published his fantastic paper "A Heterarchy of Values Determined by the Topology of Nervous Nets." Of course, McCulloch wasn't writing for students of business administration or theory of management. His starting point was neurology, and he dealt with the question as to why people are organized in a way that they adopt the value anomaly as so-called normal behavior. He showed that the nervous system builds a sensomotory circuit via the so-called "reflex arc". A stimulus produces a response that leads to a motor activity, which in turn leads to another stimulus. What we have here is a sensorimotor circuit, a loop consisting of seeing and acting, acting and seeing, which leads to a stability of action. But this is not all. As McCulloch mentioned, a theory of valuation must contain the possibility of choice. Yet the word "choice" implies that two or more potential acts are incompatible. That means that the act that takes place has to change all of the incompatible acts. In other words, in the case of two complete sensorimotor circuits, which each determine one behavior, the possibility must exist that one will block the other incompatible one (Fig. 5a). This scheme can be expanded as you choose (Fig. 5b) and it shows that the organization of a hierarchy can be drawn on a plane. The circularity of the value anomaly does not emerge until the inhibitors form a closed circle (Fig. 5c shows this closure through an inhibiting link of the inner circuit to the outermost circuit, which McCulloch called "diallels".) The topology of this organization can no longer be drawn on a plane. The appropriate geometry is that of a ring (torus), in which the sensorimotor circuit runs across the surface around the outer circuit of the ring, while the inhibitory circuits run alongside the periphery of the cross section. I'd like to point out that the word heterarchy stems from the Greek words *heteros* (the other, neighbor) and *archein* (to rule). Thus heterarchy means the rule of the other. It is no longer the holy one who rules from on high. There is no longer any point in

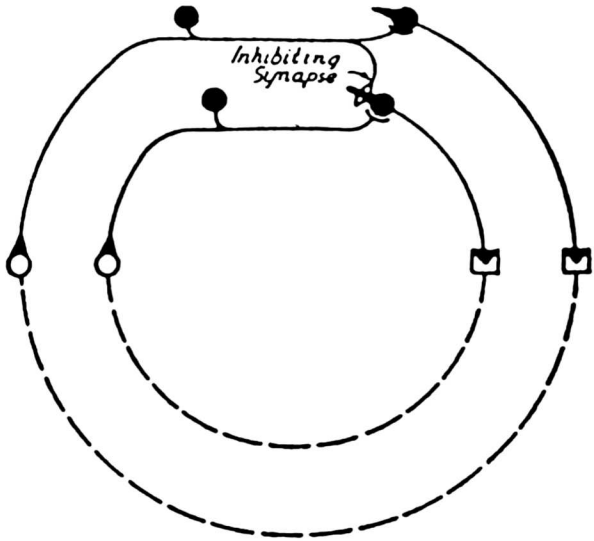


Fig. 5a The sketch shows two sensorimotor circuits in which the outer circuit inactivates the inner circuit via an inhibitory synapse. The broken lines symbolize the closure by the outer world. The continuous lines describe the nerve paths. The small open circles represent sensors. The small squares stand for the motor units (muscles). The excitatory synapses are represented by the black dots. The inhibitory synapses are symbolized by loops around the "dendrites".

talking about absolute values. Everyone is involved in ruling. Ruling becomes circular.

B. P. So what does that mean for the organization of a company?

H. F. From a heterarchical point of view, each employee in a company is a manager in his or her own area of expertise. The man at the lathe decides about questions that arise in his area. He knows best how a lathe operates, how you produce a newel from a certain steel that is a certain diameter. He is no longer a subject. And this new perspective means a huge psychological release. A new organizational structure emerges that I propose we could paraphrase with the word heterarchy. In a heterarchy it is always the other person who makes the decisions. Since I am another person in the eyes of another person and every other person is another person to the other

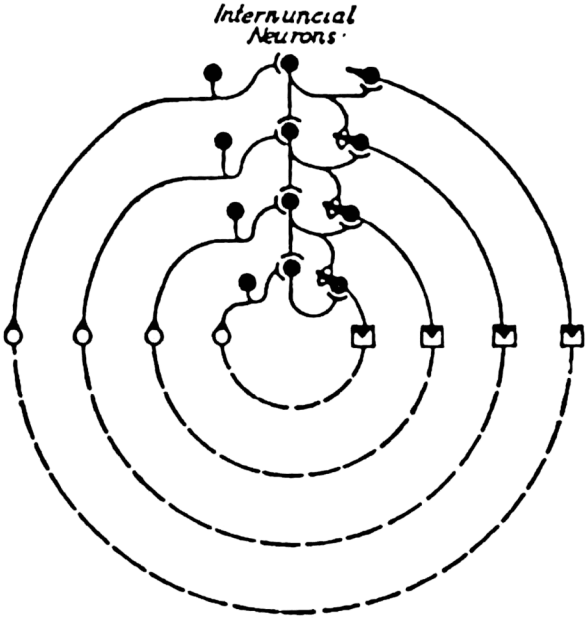


Fig. 5b

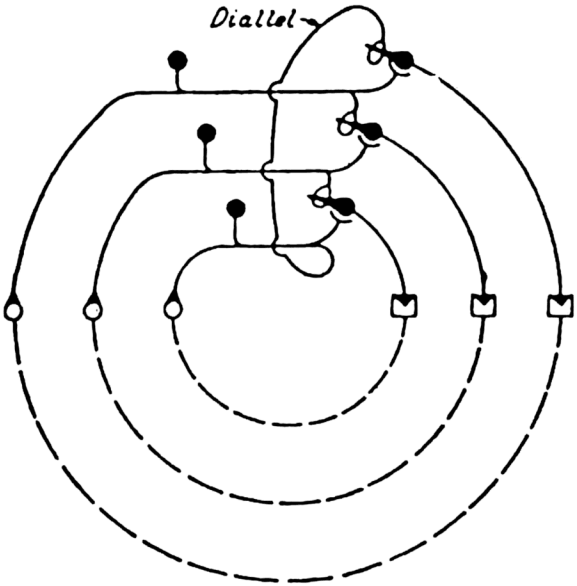


Fig. 5c

person, I have a turn at making a decision and the other person also has a turn. In so doing, each person gets to make a decision. That is a circular structure. Everyone rules together and for each other. The managers are distributed throughout the entire company. Everyone has to listen to what his or her neighbor has to say, who in turn has to listen to his or her neighbor, who might even end up being himself or herself.

B. P. What you are suggesting here sounds like a great deal of confusion and not like a gain of certainty but more like a loss. No one in a company knows who possesses the actual authority to make decisions.

H. F. The emergence of uncertainty that you are complaining about now is what is the actual crux. It gives rise to questions. Uncertainty allows questions to be posed, invites answers that have not been set in stone but instead calls for answers that have been arrived at in an independent and responsible manner.

B. P. For someone who, in terms of hierarchy, tends to turn up in the lower part of the totem pole, the heterarchical model is quite attractive. You get more power and your voice is heard. Of course these ideas also mean that a certain heroic manager mythology has to be destroyed. This mythology has to do with the lonely but correct decision of overworked and self-sacrificing leadership figures. Managers lose their superior position and can no longer present themselves as victorious military commanders who struggle for huge profits for the company under their leadership.

H. F. At the beginning of this conversation you asked me what managers can learn from me. Well, the only thing they can learn from me is that they can't learn anything from me. But they can learn everything from the people in their company. They can learn something from the person at the lathe, their salespeople can teach them things and so can the mail carrier. If they are willing, they can become a creative element in a heterarchical organization that we refer to as a company.

B. P. The heterarchical model's attractiveness is also measured by whether or not it permits an effective and harmonious interplay among individual persons. Can you use an example to illustrate this model?

H. F. The Midway Islands are situated between the west coast of the United States and the east coast of Japan. During the Second World War, a naval battle took place between Japanese and American fleets that went down in history. The Japanese fleet completely outnumbered the American fleet. At the start of the battle it destroyed the U.S. flagship, which was the command center and used a sophisticated telegraph system. This meant that they had destroyed the head of the hierarchy. The amazing result of this action was that the American ships quickly organized themselves in a heterarchical manner. Of course they weren't aware that they were doing this nor did they know anything about the neurological parallels of their behavior. The crew of each of the ships took on responsibility for themselves, reporting to their fellow ships when an enemy ship approached and then shooting at them. The new admirals were the captains of the measly gunboats that were circling around. And on the same afternoon, the entire Japanese fleet was destroyed. This example shows that a heterarchy can emerge under the conditions of self-organization.

B. P. I think it is important at this point to define the notion of self-organization that you have just touched on. Economist and Nobel laureate Friedrich von Hayek pointed in the right direction when he wrote that there was "only one way to conquer an individual's limits of mental ability and that is to mobilize the superindividual forces of 'self-organization' that create spontaneous orders." Thus, self-organization can be defined as the spontaneous emergence of order that has always been present in an unquestionable manner when a company is organized in a rigid hierarchy. In management, the notion of self-organization takes on its contours when it is contrasted with the idea of external control and rule that is enforced by a boss who issues orders.

H. F. Of course. If you use this interpretation by Friedrich von Hayek and apply it to our example, you could say that during the

Battle of Midway, the American fleet self-organized in a heterarchical manner. And then you could add, "Dear Mr. Von Hayek, Congratulations! You have once again hit the nail on the head! ... Self-organization can emerge spontaneously!" But I'd like to clarify that we should avoid jumbling up the notion of self-organization with the word heterarchy. We are dealing with different phenomena here. Of course, it is possible for a heterarchy to develop from a hierarchy spontaneously and on its own, although this is not necessarily an overnight process. This can often take decades to occur. It's correct that there are many aspects in which the two terms heterarchy and self-organization overlap and can be related to each other, but I would still prefer that they be treated separately.

Principles of self-organization

B. P. Can the characteristics of a self-organizing system be described any differently? How would you define the notion?

H. F. I wouldn't define it at all. I suggest that we abstain from drawing up more definitions and that we discuss a number of thoughts and ideas that might lead to a more in-depth and dynamic interpretation.

B. P. Let's look back in time. Who coined the term "self-organization"?

H. F. The term was first used in the 1950s by W.A. Clark and B.G. Farley, who were both electrical engineers. They recognized that operators that are in a closed relation somehow stabilize. Without being aware of a theory of recursive functions or eigenvalues, they also observed the phenomenon that certain closed systems develop stable forms of behavior after a certain time. Somewhere around 1990, Hans Rudi Fischer, in a meticulous historical analysis, showed that the basic ideas on which self-organizing systems were based may have even been touched on by Immanuel Kant. According to Kant, "Parts of a whole come together as an entity by virtue of the fact that they are the mutual cause and effect of their form." Today we would focus on the circularity of their organization. But, first, let's return to the 50s. People constructed models of binary networks in which lights go on and off. And the amazing result was that after a phase of randomly going on and off in no detectable order, the

lights began to blink in a strange dance-like rhythm. If you inserted a little perturbation a different blinking pattern developed. At any rate, I found Clark and Farley's work extremely interesting and I proposed to the Office of Naval Research, which funded my own research laboratory at that point, that they sponsor the first large-scale symposium on questions of self-organization. It took place on May 5 and 6, 1959 in Chicago. And I gave a talk there.

B. P. What did you speak about?

H. F. I pointed out to the audience that when we talk about self-organization we need to invent a measure for the increase or decrease in order. Based on Claude Shannon's theory of information and the notion of redundancy, I proposed a type of measure that allowed the degree of order within a system to be determined and expressed in mathematical terms. I also felt it was important to show that the idea of self-organization, which assumes a system that is thermodynamically completely closed, is unacceptable. I warned that the word "self" should not be taken too seriously. Nor should we only look at what we presume to be an isolated system that is no longer perceived in its environmental context. I pointed out that this environment functions as a supplier of energy. The system needs it in order to keep on organizing itself.

B. P. How can the relationship between environment and system be defined more precisely? The idea that an external environment determines the internal order of a system defies the concept of self-organization.

H. F. Of course. At this symposium I presented the principle *order from noise* for the first time. This principle provides answers to your question about the relationship of internal order and environmental states and can be illustrated using a simple experiment. You take a few small cubes that have magnetic material glued to them and are just light enough to be able to barely float. You put these cubes in a container of water, start shaking it a little bit, thus adding some undirected energy to them, producing noise in the environment. At the beginning the cubes drift around aimlessly, but all of a sudden they start combining themselves and developing the most incred-

ible structures, beautiful crystals and fascinating clusters. These combinations all have their own internal structure that has been realized by noise, in this case, by shaking. So, you see, the system doesn't import order from its environment. Instead, it is an undirected influx of energy that is integrated into the system and which is used to create its own internal order.

B. P. How can your understanding of self-organization be applied to the concrete leadership tasks that are carried out by managers?

H. F. I would like to invite you to interpret the concept of the "self" in a dynamic way and to view the notion of "organization" from a different perspective. If we choose a path that is a bit more complex instead of one that is equipped with prepackaged definitions, it could be that our understanding will reach previously unknown depths.

B. P. The concept of self-organization is a fad that is part of any management that considers itself to be state of the art. It practically suggests that everything will straighten itself out and organize itself, and we don't have to do anything at all. In many contexts "self-organization" has become an excuse for not doing anything.

H. F. Right, and I do not want to have anything to do with this popular game that lets us wriggle out of our own responsibility. But let's take a moment and ask ourselves what the word "self", an extremely slippery word, means. After all, it has been a banana peel to many a philosopher along the way, even causing a bloody nose or broken elbow every now and then. Shall we?

B. P. The first characteristic: The word "self", the first part of the expression, contains a moment of circularity. It refers back to the person who uses it.

H. F. That's very good, right. The consciousness of consciousness is *self*-consciousness. The understanding of understanding is *self*-understanding. And the organization of an organization is a *self*-organization. I propose that whenever this *self* crops up we emphasize this moment of circularity. The result is this: The self does not

appear as something static or firm but instead becomes fluid and is constantly being produced. It starts moving. I would plead that we also maintain the dynamics of this word when we speak of *self*-organization. The way I see it, the self changes every moment, each and every second.

B. P. From this perspective a person's identity no longer appears as something that can be determined but as a manifestation that is rooted in the moment, the result of constantly changing interactions and encounters. The only constant is change.

H. F. Exactly. Change and movement are constantly at play. The notion of the self is the narrowest and final form of circularity. It is the circularity of the "I". So what is this ominous "I"? I believe that it is the reflection of the reflection of the reflection ad infinitum. The "I" can be understood as the eigenvalue of the infinite reflection about oneself. This idea of an uninterrupted movement needs to be distinguished from the idea of an identity that is thought to be static, which is what psychologists are talking about when they diagnose an identity crisis in their patients. However, I would confront these psychologists with the fact that they are the ones who have produced the crisis because they believe in something like an identity in the first place.

B. P. From this point of view the self appears to be something dynamic and fluid. How would you like to describe the word organization?

H. F. Let's keep in mind that when something organizes itself the degree of order increases. Of course, no one actually worries about what the increase or decrease in order or the improvement or deterioration of an organization mean. To put it in a nutshell, before we can start talking about self-organization, we need to invent a measure for the increase or decrease in order. What do you think are the criteria that managers use whom we might ask to give us their ideas about a *better organization*?

B. P. I would suppose that these managers would get out their balance sheets, mention figures, and talk about increasing sales.

H. F. Well, if this is how they do their assessments, it wouldn't matter to them if the people in their company are happy or if they earn a lot or a little. The result of this is that downsizing, decreasing the size of the staff and throwing out lots of employees, appears to be a worthy objective. Downsizing saves on salaries and the costs of employee benefits. Managers who use this type of strategy do not see their companies as a complete organism. Instead, they can only see the profits the companies should be making, and not the health, happiness, and well-being of the people who work for them. That is the reason that I find it so important to work out the criteria that you use to describe an improvement in the degree of the organization. Otherwise it is not clear whether talking about self-organization is a good or a bad thing.

B. P. What criterion would you use to evaluate the increase in order of a self-organizing system?

H. F. The way I see it, there are two very important criteria: One is a heterarchical mode of communication and the other is the perception of the company as a whole. In a heterarchically organized company, each person has an opinion that can be heard and that counts as a vote when it comes to improving the product. For instance, the people in the design department communicate with the people who work at the lathe when a certain product's packaging needs to be improved. You could also say that individual heterarchical islands or individual departments join forces and form a cooperative network.

B. P. If you accept this dynamic and holistic interpretation of the different terms, then the managers' task would be the *organization of the self-organization*. They would ensure that the individual employees communicate with each other and that their voices are heard. The managers see to it that their employees' talents can be allowed to blossom in a way that the company can benefit from it and there is a dynamic atmosphere at the company.

H. F. The task of these kinds of managers is to ensure that all of the employees feel that they work in a company that functions well, is friendly, and is high quality. They should not just try to please the

handful of employees who get a thrill out of paying out a bonus to the shareholders. No, they also need to pay attention to the cleaning staff who work at the company. They should try to position themselves and the others in a heterarchical network such that the flow of well-being reaches and touches all of the members of the organization. And if they succeed in setting up the company in this way, they have met their objective: The organization has organized itself, and has done so in a way that everyone feels good about.

4. Communication

The world contains no information

B. P. One thing that meets the eye is the fact that all of the disciplines and processes of changing people that we have talked about so far are all dependent on communication in some way or other. Educators communicate with students, therapists with clients, and managers with employees or their fellow managers. This gives rise to the next set of questions: "What is going on here? What is communication and what isn't?"

H. F. I think it would be quite useful to use a very simple and uncomplicated idea of communication to answer this question. It can be found in thousands of early textbooks. You always see a certain picture: Two boxes that symbolize the sender and the receiver. These boxes are usually connected by a line that is supposed to represent the channel of communication.

B. P. So the model emphasizes that communication should be understood as a simple transfer of information from a sender to a receiver?

H. F. Actually, there is more to it than that. In the framework of this model information is seen as an object. It appears as a material or a substance that can be transmitted through pipes. I found this confusing from the very point at which concepts started gaining in popularity. In the late 1940s, Claude Shannon and Warren Weaver wrote a very important little book entitled *The Mathematical Theory of Communication*. In this book they used the models of telephone

technology to discuss the exact transmission of *information* from a sender to a receiver. Their ingenious and fascinating thoughts have served as the basis for a number of erroneous ideas about the communication process. Even back then I contended that what they had called information was in actual fact a signal, which meant that the information theory, which addresses the problem of how a signal that is coded as a message is received through a noisy channel, is actually a signal theory.

B. P. In your theory the knower is of vital importance. What then is communication? What is information? Where is it located? How does it come about?

H. F. It comes about in any person who knows what to do with a signal. The way I see it, it is not some kind of utensil that is located somewhere outside our field of awareness. Books and newspapers, audio and videotapes, street signs and so forth do not contain information, but rather they transport potential information, and that is an important difference. If you don't understand Chinese, the characters of the I Ching will just look like a bunch of chicken scratches on white paper. *The world contains no information. The world is as it is.* That means that if you see a certain road sign or a red light, and you have just gotten your driver's license, this signal can turn into information that will prompt you to step on the brake, release the clutch, and stop the car. It is the operation that takes place in a person who has transformed a signal into a piece of information.

B. P. So you can describe communication as an individual construction of meaning?

H. F. Of course, although the result of this construction of meaning doesn't have to be so personal. Most cars stop when the light is red. The reason for this is that we live in a culture that gets us to develop a stable eigenbehavior and to interpret signals in a specific way, understanding them as an invitation to behave in a certain way – and in the case of the red light, to step on the brake. You might even say that we are not informed, but rather "put into form". It is our inner form that is our very own and that allows us to react in a certain way.

B. P. What does it mean when we talk about understanding a signal, an explanation, a thought, or an idea? How can we describe the experience of understanding and meaning?

H. F. The logic of the question you have just asked is quite unique. You want to understand understanding. You are asking about your own recursiveness by asking recursively. You are trying to get an explanation out of me, and I have already said that I see an explanation as a semantic relation between two descriptions.

B. P. What are you getting at?

H. F. Well, you can characterize the experience of understanding from a neurological or a poetic perspective. But I'd like to respond with a little anecdote instead of talking about synapses, electrical impulses, or the metaphors of a poet. My wife and I once invited a student to our house. He came from a small African village and his name was Ignatius. He studied agriculture at the University of Illinois and lived with us for a while. Ignatius was a member of the Ibo tribe, which lives on the western coast of Africa. One day I saw a black and white picture of the chief of the tribe on his desk. Since Ignatius loved taking pictures, we decided to give him a little camera for Christmas. He was quite excited and began taking pictures. He took the film to be developed, but when he picked up the finished pictures for the first time, he was upset, saying, "I've been cheated! I used color film to take the picture of our chief that was on my desk. But the pictures that I got back are only black and white. I've been cheated!" I told Ignatius that wasn't right, because the original picture, the one on his desk, was black and white too. He told me that while he understood that, he still felt cheated since he had used color film to take the picture. Just then, my son Tommy, who is a physicist, gave him a long and involved technical explanation, and Ignatius said that while he understood everything perfectly well he had been cheated. This of course showed that the physical explanation had not cleared anything up at all. Finally, one day a young man visited us who had worked as a teacher in Nigeria. I told him that we had tried hard to explain to Ignatius that he had not been cheated, since you can't turn black and white pictures

into color pictures by simply taking them with color film. At which point the teacher turned to Ignatius, looked him squarely in the eye, and said loudly, "It doesn't work!" To which Ignatius responded, "Aah, now I understand."

B. P. So if I interpret this example correctly, you could say that understanding and comprehending come about in the form of an interaction between what is said and what someone already knows and expects as a result of his or her particular culture or background. In the example, the way the explanation was phrased did not fit with the form that this African student expected of an explanation. When the explanation was offered to him in a syntactic structure that seemed familiar to him, he was able to understand.

H. G. Bravo! I couldn't have put it better myself. You just did a fantastic job of describing what a moment of understanding or comprehending is. You said exactly what *you* needed to understand what you wanted to know. *Your* interpretation of this little anecdote is a wonderful illustration of the hermeneutic principle I once coined: *It is the listener and not the speaker who determines the meaning of a statement.* We generally believe that it is the speaker who decides what a statement means and the listener has to understand what the speaker has said. But that is a fundamental error. It is the listener who interprets the strange noises that are produced by me or someone else with the help of our own vocal cords and gives them a meaning or rather his or her own meaning.

B. P. That gives rise to the next question, which is whether there is one and only one statement, or if there are in fact different versions and interpretations of what we perceive to be one and the same item.

H. G. In my opinion, even paraphrases do not describe the same thing. One of my colleagues, who also taught at the University of Illinois, carried out some absolutely incredible experiments. They demonstrated the way what appears to be the same observation is put into language – and the result. He once asked two hundred students to describe the following: There was a long string that stretched across the lecture hall on which two balls, a little one and a big one, were strung. He took the big ball and whipped it against the little

one. The big ball bumped the little one. That was it. The male students tended to write that a big ball had touched a little one and bumped it out of the way. They perceived the aggression. The female students usually observed that a little ball had been bumped out of the way by a big one. They saw the event from the perspective of the victim and gave it another meaning. In both cases the respective observer's reflections played a role in the observation.

Realities of the media

B. P. If there is no longer a single, universal meaning of an event, then there is no longer any basis for the demand for objectivity. Because in order to decide whether a statement is true or false, we must at least conceive of the possibility that agreement on meaning can actually be reached. What is your message to journalists, then? After all, the objective description of an event is part of their professional ethics.

H. F. That calls for another little story, that took place at Stanford University. I was invited to hold a lecture for journalism students. When I entered the door of the journalism building, I noticed that there was an inscription over the door that said, "Tell it as it is!" I went into the lecture hall and started off my lecture as follows: "Ladies and gentlemen, I quite enjoyed reading your motto, but I need to let you know that it needs to be changed. It should actually say, 'It is as you tell it!' The original wording only serves to allow you to shuck the responsibility for your own reporting. It turns you into a passive register of events, like a human tape recorder. I claim that by observing an event, you use a language and create what was. Yet no one knows how anything 'was'. What was can only be reconstructed by what other people say. Anything that has ever been said about the past is the invention of people who talk about the past."

B. P. Surveys show that the majority of journalists do not see it this way. Klaus Bresser, editor-in-chief of one of Germany's official television stations, writes, "Journalists need to report about what is there. They need to separate what is true from what is false and separate the wheat from the chaff."

H. F. Well, this nice man has determined what is wheat and what is chaff. It's as simple as that. His wheat is transmitted and marketed and whatever he considers to be chaff is thrown down the chute. His colleagues, however, may not agree on his criteria for what is worth reporting on and what events should be glossed over or not touched on at all. It could be that their chaff is their wheat.

B. P. But deciding what is real is not arbitrary.

H. F. Everything that we say has been put through a *cognitive machine* that then generates a world with noises that come out of someone's mouth or as chicken scratches on paper. And this world is generated by another person who hears, sees, or reads and this also happens in his or her own way. Who is in possession of the truth? Does God send down a message from heaven that decides on the answer to this question? Who knows how it really was? The way I see it, no one does. The only thing that we can see is that the *New York Times* prints other stories than the *National Enquirer*. All we have are pictures that we can compare to other pictures, and we can decide which of the stories and which of the pictures we prefer to believe. I personally prefer to go with the *New York Times*. The pictures and articles in the *National Enquirer* are constantly about sex and murder and I find that disgusting.

B. P. Do you believe that not even pictures represent *reality*?

H. F. I'd like to respond to that question with a little joke. There's a rich American traveler who wants to buy a painting and visits Picasso at his castle. Picasso is quite flattered by this and shows the man around, pointing out his paintings. Finally the traveler says, "Mr. Picasso, I'd like to ask you something. Why don't you paint the people the way they are?" And Picasso asks, "How should I do that? How does that work? What are people like? Can you give me an example?" So the rich man opens his wallet and pulls out a little picture and says, "See, here you can see what my wife looks like." Fascinated, Picasso takes the picture, turns it over and says, "So, that's your wife. She's so small. And so flat!"

III. Cybernetics

The Fundamental Principle: Circularity

B. P. When people look for your name among the scientific literature, they find publications on cognition and constructivism, theories of memory, and the concept of self-organization. But you are best known for your work as a cybernetician. But before we start, what would a definition of the word cybernetics look like? What is cybernetics?

H. F. I am not particularly crazy about the search for a definition, because doing this always means creating a conceptual limit. You could also ask me, "What is a table?" And I'd answer, "A table has four legs and a flat top that kids can jump around on." Now we have to clarify what the difference is between a table, a pony, and a horse. And by the time we are done, we will have had to clarify the difference between animate beings and inanimate entities. That's what we get. The way I see it, every definition has a fundamental weakness: It excludes and limits.

B. P. But it does make sense to sort out the many definitions that are circulating at the moment. For example, mathematician Norbert Wiener has written that cybernetics is the science of communication and control in the animal and the machine. Management consultant Stafford Beer defined cybernetics as the science of effective organization. Neurophilosopher Warren McCulloch called cybernetics a theory of knowledge that deals with the generation of knowledge through communication. A statement by the American Society of Cybernetics says, "Cybernetics is a way of thinking, not a collection

of facts." And Gordon Pask summed it up in even more general terms: "It might be an art, or a philosophy, a way of life."

H. F. The first thing I would like to do is to congratulate my friends for the way in which their different perspectives have resulted in an absolute rainbow of attempts to define the word "cybernetics". This is a perfect illustration of the kind of thinking that allows a wide variety of approaches in a very relaxed spirit. It shows that we are talking about an attitude that each of these people interprets in his own way. That is the fascinating thing about cybernetics. You ask a couple of people to give you a definition and although you don't get to know much about cybernetics from them, you find out a lot about the person supplying the definition, including their area of expertise, their relation to the world, their desire to play with metaphors, their enthusiasm for management, and their interest in communications or message theory. It's a way for me to get to know my friends Stafford Beer, Warren McCulloch, Norbert Wiener, and Gordon Pask better. That's just marvelous.

B. P. Is there a particular principle that all of these notions of cybernetics share?

H. F. The way I see it, the fundamental principle of cybernetic thought is the idea of circularity. That's where everything begins. It's the base camp for more challenging treks. The principle of circularity can have huge consequences when it is definitely thought through, in depth, and is connected to epistemological questions. All of a sudden you enter a "No Trespassing" zone and end up dealing with the self-reference that is the object of scorn among logicians. However, it can take some time to discover all the consequences of circular causality. I recall once writing a paper in which I pointed out that circularity is the essence of cybernetics and that this principle needs to be examined in much more depth. I wrote about a new dimensionality of arguing that replaces linear causality. The paper was to have served as the foreword to the reports of a series of important cybernetics conferences. But it was sent back and I was asked to write something about the water closet, the thermostat, or the Maxwell regulator in a steam engine instead. I responded that I was not particularly interested in the water closet and that

while I felt that the thermostat had made a major contribution to making life more pleasant, I didn't consider it to be all that important.

B. P. The main examples that were being used at the time, which included thermostats, water closets, and helmsmanship, did not exactly encourage epistemological reflection. But would you mind using one of them to explain circularity?

H. F. The best thing to do is to talk about steering a boat, since the word cybernetics, which Norbert Wiener coined and used for the title of his book in 1948, is taken from the Greek word for steersman (*kybernetes*), which became *gubernator* in Latin and eventually *governor* in English. If you follow the etymology, an American governor would have to be a cybernetician. But back to our example. What does a steersman or pilot do when he wants to maneuver his ship safely into a port? He doesn't just follow a permanent checklist, but instead is constantly varying his method according to the conditions. When the ship goes off course and veers left because the wind is blowing hard, he adjusts the course in order to continue heading into the port. He attempts to correct the mistake. And perhaps he may start steering too hard in the other direction. This might result in a deviation to the right and the need to correct it again. At that point the deviation in relation to the target that had been set, the *telos*, which could be a port, is adjusted. Manipulating the rudder, which is a cause, thus generates an effect: The correction of the course. And this effect in turn becomes a cause, because yet another deviation has been detected. So this gives rise to another effect, which in turn is a correction of the course. This kind of steersmanship is a wonderful example of circular causality.

B. P. What is happening here is basically a process of evaluating information which changes a person's behavior each time. You notice a deviation in the course and act accordingly by adjusting the course.

H. F. This is the very aspect that the early cyberneticians – Norbert Wiener, Claude Shannon, Warren Weaver, and Ross Ashby – always had in mind. They pointed out that the steersman needs to send a message to his motor system as to how and to what extent he should

move the rudder. And this message about the manner of the movement in relation to a certain target can be understood as a process of the evaluation of information.

People and Machines

B. P. From this illustration of the term cybernetics we can go on to the potential applications and the use of these insights in the construction of refrigerators, thermostats, or anti-aircraft missiles. All of these objects work with these kinds of circular-causal steering mechanisms in order to meet a certain objective – a certain temperature or hitting a hostile object. That would be the practical and even martial utilization of circular causality. But I'd like to move on to another subject that is of more of a theoretical or epistemological nature and is more closely connected to your work. I'm interested in how, on the basis of these and other concepts, the idea arose among the cyberneticians to decode and understand the living being itself, that is, the human being and his or her brain.

H. F. To answer that you need to keep in mind that the study of circular causal processes made the concept of teleology interesting for the early cyberneticians. You pose the questions, "What do you do to attain a goal? How does this happen? How can machines be constructed that move toward a target? Can we understand living beings by using these insights?" In 1943, Norbert Wiener, Arturo Rosenblueth, and Julian Bigelow reintroduced the concept of teleology, which actually stems from the Middle Ages, to science. Their paper was entitled "Behavior, Purpose, and Teleology." In a critical analysis of the definition of behavior that was en vogue at the time, and which focused completely on the relationship of an "output" to an "input", they noticed that this narrow definition completely ignored the acting organism, its specific structure, and its internal organization, which actually gave rise to this relationship. At the same time but in a different context they analyzed a frog, and pointed out the observation that in everything it did, it moved toward a target, a telos, to carry out an activity such as catching a fly. It was the focus on the phenomenon of single-mindedness that appeared to be common to the living and technical systems.

B. P. If I have understood you correctly, this means two different things. The study of teleological processes first allowed the phenomenon of circular causality to be revealed. In order to reach a target, individual behaviors and actions need to be corrected. As a result, one's own actions become the cause of one's own actions. The second step is that the idea of teleology also made it possible to discover a potential common ground between living and nonliving systems.

H. F. The first thing that was discovered was a technical language that could be used to explain the operations of living beings. Please recall that I have described an explanation as a semantic bridge that connects two observations. It is a phenomenon of language. We asked the question, "Why does the frog hop to a certain place?" And we came up with the answer, "*Because* it wants to eat the fly that it finds at this place." What happened was that we constructed a semantic relation that was similar to Aristotle's *causa finalis*. The cause is in the future and the action is in the present. The hopping of the frog appeared to be its attempt to attain a certain goal.

B. P. Are there any other publications or approaches that made living beings and machines appear to be similar in the thoughts of the early cyberneticians?

H. F. In 1943 neurophilosopher Warren McCulloch and a brilliant young mathematician named Walter Pitts published a paper that was of seminal importance. It was entitled "A Logical Calculus of the Ideas Immanent in Nervous Activity" and dealt with the function, excitation, and pulse transmission of neurons. McCulloch and Pitts showed that a single nerve cell possesses the curious property that when a stimulus reaches it, it either responds or doesn't respond, but it doesn't do anything that is between response and no response. It either fires or it doesn't fire, sends an electrical pulse via the axon or doesn't send any pulse. If this electrical pulse reaches a second cell, and should this cell receive pulses from other cells, then very peculiar combinations emerge. And this time it's the same: This second cell, which receives pulses from different other cells, either fires or doesn't fire. McCulloch and Pitts saw that this activity of the cell can be understood as the computation of a logical function,

which goes as follows: *Yes* or *No, Fire* or *Don't fire*. Against the backdrop of these ideas, it was possible to imagine nerve nets that compute all logical functions. And then researchers began to speculate about these nerve nets, which, they thought, are actually able to decide whether a sentence is valid or not. You insert a sentence into a nerve net, and if the last neuron that is reached by the pulse of the sentence does not fire, the sentence is false! Or it does fire, and then the sentence is true! If you follow these assumptions, the nervous system can be interpreted as a type of computer that executes a logical calculus. And from this perspective, a neuron appears to be an operator that computes such logical functions. These fascinating ideas and this fantastic mathematical structure enable us to construct artificial neuronal networks.

The Computer Metaphor of the Mind

B. P. Why was this work so important? Did it make it appear to be possible to technically reconstruct the activities of the brain, which also processes and evaluates sentences and statements?

H. F. Of course. After all, the brain is made up of neurons that are coupled via the synapses and the axons. This type of nerve net can then be understood as a calculator that carries out inductions and deductions of certain statements and observations. But let's go back to the story. It was the famous mathematician John von Neumann who used McCulloch and Pitts' study to build computers. He showed that the Turing machine and the neuronal net, whose mode of operation McCulloch and Pitts had described, represent equivalent operators. This is how the computer metaphor that continues to play a significant role in current cognitive science came to be used. Researchers believed that they could reproduce the neuronal structures that make up the brain by creating a rudimentary computer that was based on the insights of McCulloch and Pitts. The construction of computers that supposedly operated according to the principles of the neurons only permitted the conclusion to be drawn that the brain appeared to be a gigantic parallel computer.

B. P. John von Neumann even spoke about the construction of artificial brains and continually pointed out the similarity between the switching elements in computing systems and the neurons.

H. F. That's correct. On the other hand it was not just the early cyberneticians who worked on drawing parallels between man and machine or the brain and the computer. Journalists also did a great deal to spread these analogies. It just sounded so exciting when you could write: The brain operates like a machine. And even worse, it is *nothing other than* a machine. And then came the somewhat strange inversion of this analogy: This machine operates like the human brain. Of course it is easy to understand that we project the properties of our own body onto something else; we do it all the time, like when we talk about legs and joints when we refer to furniture and machines. And so in the 1940s, several authors wanted to explain the fast computers using literary devices such as similes and metaphors. They wrote about the "electronic brain" and the "memory of machines". Despite the fact that no one knew, nor does anyone know today, how the brain or the memory functions, it somehow seemed amusing and entertaining to use one obscurity to explain another one.

B. P. Is there any aspect for which these types of analogies and metaphors are legitimate and make sense?

H. F. Of course it is possible to characterize an operation that is executed by the brain by using a machine mechanism. There's nothing wrong with that. Of course I can use a metaphor and say that when I'm cold, the brain turns up the heat. I might also say that when a thermostat senses a certain outside temperature it also turns up the heat. Of course it is legitimate to describe a phenomenon or a set of phenomena using a metaphor, although you need to keep in mind that any description that is of a formal, mathematical, quantitative, or poetic nature is merely a comparison. If you invert the metaphorical relation and say, "The brain operates the way this machine does," then things start getting dangerous. You believe that you can understand the brain because you have understood the machine mechanism that you are assuming. You think that you can comprehend memory when you metaphorize it as a storage mechanism and this may even lead you to look for a place in which a cer-

tain piece of information is "stored". The result is that we become blind to the miracle of the brain. I figured out how precarious this was fairly early on and I have always criticized such metaphors and analogies. But my criticism fell on deaf ears. It was like speaking into a void.

B. P. We have to keep in mind that a metaphor is made up of two elements; one that provides an image and one that receives an image. When I say that the brain is a machine, our ideas of a machine provide images. The element that receives the image is the brain. If I claim, however, that a certain machine operates like a brain, the machine is the recipient of the image and the brain provides the image. This means that in the case of the metaphorical relation between the brain and the machine, the brain has primacy one time and the machine, whose characteristics are applied to the brain, has primacy one time.

H. F. Yes, you can put it that way. It seems to me that the important thing is that a computer or any other machine is produced synthetically. They are built by us and this is how we know how they operate. And when you take the way a machine operates and apply it to the brain or the human being, the idea arises that you have now understood how the brain and the human being work. But this is obviously a misconception. And that is the crux. You take something that is known and understood and apply it to something that is unknown and not understood, and think carelessly that you have understood it. Yet when we do this we forget that there are systems that by their very nature simply cannot be analyzed. Once you have figured this out you start viewing all of these metaphors very skeptically.

B. P. The claim that we can unravel the human mind and will even understand it sometime in the near future is like a virus that has infected Artificial Intelligence and robotics, two areas that are based on cybernetics in many of their aspects. Using the machine metaphor, the human is perceived as an "information processing system". The thought process appears as "data processing", and the brain was even referred to as a "meat machine" by Marvin Minsky, the star of Artificial Intelligence.

H. F. These comments demonstrate the suggestive power of such metaphors. As you can see, they have lost their descriptive function and have become their own thing. What is happening here is some kind of grotesque machine worship. And these types of image and ideas are the catalysts for certain types of steps. For instance, this is how the neurophysiologists received funding from a wide array of sponsors in order to search for "engrams" in the cell tissue of the brain. These were supposed to be experiences that a person had during his or her life and, to stay with the metaphor, which had been stored in his or her memory from the point of the experience on. The question was, "Where is the word *and*? Where is the memory of my grandmother or of the schnitzel that I ate for lunch today?" The quest for the engram was, and has remained, unsuccessful. Memory cannot be located in a particular spot in the brain. But in my opinion these kinds of thoughts and metaphors are still dangerous. They seduce us into looking at things in a way that trivializes them. They make certain steps appear to be possible that may not even be appropriate for the miracle of the human being.

Cybernetics of Cybernetics

B. P. This use of the metaphor, which serves to trivialize, can also be interpreted from an epistemological point of view. It is the linguistic indicator of a certain epistemological position and of a style of thinking that is mechanistic and fundamentally naive-realistic. When you see the human brain as a machine or as a computer, or memory as an information store, you always assume that a phenomenon can be completely elucidated and reproduced.

H. F. The fundamental error of these brilliant and highly talented men was believing that you would always find better models that could be used to understand the brain. But what they failed to notice was that you need a brain to understand a brain and to develop models for the brain. So in fact you need to explain and understand yourself in order to understand the brain. The structure of the theory that I am talking about has to be able to describe itself. If you want to look at it from the symbolic point of view, it's the ouroboros, the snake that bites its own tail. And now we're back to circularity.

When I arrived off the boat with my bag full of European traditions and started working with the early cyberneticians, I tried to point out to them that the concept of circularity was also fundamental in an epistemological point of view and that it has far-reaching consequences.

B. P. What are these consequences?

H. F. What emerges is an attitude that is completely different from what one set out to explain. You end up in a loop that connects the observer to the respective object that is under inspection. You not only have to explain the brain of another person but also your own brain that is being used to work out the explanation. And suddenly, the cybernetician starts speaking about him or herself and just as suddenly a "cybernetics of cybernetics" or a "second order cybernetics" emerges. First order cybernetics separates the subject from the object and refers to an assumed world "out there". Second order cybernetics or cybernetics of cybernetics is itself circular. You learn to understand yourself as a part of the world that you wish to observe. The entire observational situation ends up in another area in which you suddenly have to take responsibility for your own observations.

B. P. It was your thoughts that introduced the observer to cybernetics and paved the way for the end of naive-realistic and mechanistic positions.

H. F. It is vital that the entire language in second order cybernetics changes. The references to a world that is independent of an observer are replaced by references to oneself. The descriptions always contain an element of self-description. But it is not only the language that becomes different. The reflection about the aim and object of the observations that one carries out – for whatever reason – takes on another dimension. You begin to understand why you want to know or experience something. Epistemologists who deal with the problem of cognition and approach it from the perspective of the second order always ask themselves what they will get out of knowing knowledge and what meaning the attempts to understand the process of cognition will have. They justify the epistemology epistemologically. The

idea that we have about experiments also changes from the perspective of the second order. You understand that the question that you pose already contains the potential answer.

B. P. Of course we can speak about a cybernetics of cybernetics or a second order cybernetics in order to linguistically encode the dependency on the observer that is present in all knowledge. Yet these terms are especially valid for the discipline of cybernetics. After all, that is its place of reference. But the idea of the dependence of the observer that is present in every statement is of course of a much more general nature. There is always a connection between subject and object. It's a close relationship.

H. F. That goes without saying. That's how you can distinguish between the first and the second order. The terms of the first order are based on a seemingly objective look at the world which becomes an external one. The terms of the second order can be applied to themselves. They no longer allow the strict division of subject and object, observer and observed. You admit that someone who speaks about questions of consciousness or knowledge needs a consciousness and a knower in order to do this. It becomes clear that an observation needs an observer. The perception of the world calls for a person who perceives it.

We Do not See that We Do not See

B. P. Could you use an example to illustrate the notion of the second order?

H. F. Yes, of course. Just think of the experiment with the blind spot (cf. Fig. 6 and instructions). You train your eye on the star and the black dot, which can continue to be seen for a while, disappears when it is at a certain distance from the eye. It becomes invisible. The physiological explanation for this is that at that particular distance, the black dot is projected onto an area of the retina in which there are no rods and cones and the optic nerve leaves the eye. However, what we have not clarified with this physiological argumentation is why we don't see the blind spot and why we do not even

have an inkling of its existence. The field of vision appears to us to be continuously closed. There are no invisible areas. In other words, we do not see that we do not see. We are blind to our own blindness. That is one example of the difficulties of the second order. Not seeing is applied to oneself. But be careful! The double negative (the not seeing the not seeing) does not make an affirmative. The fact that we do not see that we do not see does not mean that we now see. And that means that the logic of the terms of the second order

Fig. 6 The experiment with the blind spot. Hold this book in your right hand. Close your left eye and train your right eye on the star. Move the book slowly back and forth along your line of vision until the distance has been reached at which the big black dot disappears. If your eye is well trained on the star, the dot should remain invisible even if you move the book parallel to itself in any direction.

do not jive with that of orthodox logic, since according to that, two negatives make a positive.

B. P. The notion of the second order is illustrated ex negativo in the example that you selected. We are dealing with a self-application problem from the perspective of negation. We do *not* see that we do *not* see.

H. F. I completely agree. Of course we can find an illustration ex positivo. Just think of the notion of purpose or aim in the Aristotelian sense. From the perspective of the second order the question is, "What is the aim of the aim? What is the purpose of the purpose?" Why was the idea of a purpose introduced in the first place? When I fly somewhere I always observe the people sitting next to me and watch how they have tied their shoes. When the plane takes off, the people take off their shoes. When we approach our destination, they put them on again. They thread their shoelaces through the eyelets and execute a curious dance with their ten fingers. They create a

bow. Observing my fellow passengers has shown that they all dance differently. Every person carries out different finger movements to tie a shoe. A physicist would now write down a differential equation of the finger movements. He or she would get different equations and would conclude that the phenomenon of the finger dance cannot be explained. Yet from a teleological perspective the dance of the fingers is quite easy to explain. It serves to make a bow and tie a shoe. Here, the idea of purpose, as seen from the perspective of the second order, manages to simplify and clarify the explanation in a huge way. That is the purpose of the purpose.

B. P. So the terms of the first order can be placed on the level of perception and action that has not yet been epistemologically reflected. The terms of the second order allow the epistemological dimension to play a role, and make visible the particular interests of an observer, who may use the term of purpose. We could climb up the ladder of abstraction another rung together and from the perspective of the third order pose the question, "What do the terms of the second order do for us? What can we observe on this level?"

S. F. You have already hinted at the answer. The terms of the second order reveal insights into the process of observation that are not possible on the level of the first order. On this level you simply act, use certain concepts, presuppositions, and theories that are not reflected. The possibility of self-reflection does not emerge until we are on the level of the second order. On this level nothing is simple and nothing can be taken for granted. It is vital that the observer takes on responsibility for his or her observations, language, and action. The observer is inextricably linked to the object that he or she is observing. The epistemological and logical domain of one's own statements reaches a new dimension.

All Cretans Lie

B. P. This probably has to do with the fact that the descriptions of the second order are always self-referential. And if you transpose self-referential statements to the area of classical Aristotelian logic, paradoxes emerge.

H. F. Right. Just think of Epimenides, who came from the island of Crete and said, "I am a Cretan. All Cretans lie." You can reduce this sentence to "I am a liar". What do you do with somebody who says, "I am a liar"?! Do you believe the person? Then the person can't be a liar, because he or she has told the truth. But if the person has told the truth, then he or she has lied, because the person has said, "I am a liar." And ever since, what has driven logicians batty is that Epimenides' statement does not meet the requirements of the Aristotelian demand that "a meaningful statement must be either true or false". The sentence becomes false when you think it is true and true when you think it is false.

B. P. There's something absurd about Epimenides' attempts to confuse everyone. You never know whether this Cretan is telling the truth or whether he is lying.

H. F. Watch where you step! What can be determined is that self-referential statements were characterized like this: They were declared to be "meaningless" because, as the argument goes, they force a person to switch back and forth from a "yes" to a "no" and from a "no" to a "yes". Just think of the famous paradox with the barber who lives in a village and shaves all the inhabitants there who do not shave themselves. So does the barber shave himself? If he shaves himself he may not shave himself because he only shaves people who do not shave themselves, remember? And if he does not shave himself then he has to shave himself because he shaves all the people who do not shave themselves. In the *Principia Mathematica*, which was written by Bertrand Russell and Albert North Whitehead, it is set down in the foreword that self-referential statements of this type are more or less "prohibited". It was obvious to these outstanding logicians that it is the self-reference that generates this peculiar paradox. This means that if you were actually playing by the book, even the word "*I*", which is constantly establishing this self-reference, should be forbidden from being used any more. Now that is grotesque.

B. P. How do you deal with the dimension of self-reference in your own work?

H. F. In the terms of the second order it is not negated but accepted. However, the acceptance of self-reference does not take place on the basis of some ontological idea but rather on the basis of a conception that is quite dynamic: Classical logic assumes ontic existence. A statement *is* either true or false. The acceptance of the paradox that I am campaigning for reintroduces the dynamism of the states. You no longer speak about the being of a state but about the becoming, thus integrating a temporal dimension. This gives rise to a flip-flop mechanism. The "yes" generates the "no", and the "no" generates the "yes". The truth of a statement generates falsehood and falsehood generates the truth.

B. P. It still isn't quite clear to me which logical formalisms you use to integrate self-reference.

H. F. One day a non-Euclidean geometry was invented in the history of humankind. And in a very similar way, a non-Aristotelian logic developed not too long ago, and has different schools of thought these days. A wide array of authors has always pointed out that the paradox isn't the cyanide of logic, but rather that it can be enriching to speak about self-referential terms such as purpose, awareness, and knowledge. Just think of the papers by philosopher Gotthard Günther, who used a type of multi-valued logic that is called "place-value-logic" to transcend dualistic logic and enrich it in an unprecedented way. Günther studies the appearance of a sentence, its logical place. And a new type of logic emerges that allows or disallows the utterance of a sentence and for that reason has no problem dealing with the paradox. We should also mention the paradoxical logic that George Spencer-Brown presents in his book *Laws of Form*. For the first time, Spencer-Brown makes a formal presentation of the emergence of this new dimension, which generates the opposite of what it has just generated. It is not a matter of something static but rather of a dynamic eigenbehavior. And I would also like to mention the studies by Lars Löfgren. He dealt almost exclusively with self-referential propositions and used the term *autologic*.

B. P. Can you give an example of an autological statement?

H. F. Just take the question, "What is language?" At the moment the question is posed language is generated. Language cannot be explained ontologically or by referring to some kind of peculiar organ or device, as linguist Noam Chomsky assumes. Rather it can only be explained ontogenetically. Language *is*n't, it happens. The question, "What is language?" provides its own answer by being pronounced. It is a type of logical somersault, an autological structure! And now we're back to the principle of circularity.

B. P. Do you mind if I try to sum things up? At the outset of this conversation you described circular causality as the fundamental principle of cybernetics. You pointed out the circularity of all knowledge and described the contours of cybernetics of cybernetics. And in the end you described a new logic that does not prohibit the self-referential statements of the second order but rather permits it. Throughout the conversation you encouraged us to think through the idea of circularity with all of its consequences.

H. F. Magnificent! That is a wonderful way to end our conversation on cybernetics and circularity. And this ending is of course not an end, but a beginning that does not lead to an ultimate endpoint but can be a beginning again. Time is always implicit. It reminds me of Heraclites' statement, "Everything flows." And sometimes he added, "It is impossible to step into the same river twice." I would paraphrase that as follows: "It is impossible to look at the same face twice." You will never again see a face that you have looked at, for, like everything else, it is gone forever. But I can look at the face of Uncle Ted twice because it is language that stops the river of time. There is nothing static and there is no finality of the beginning and the end. The somersaults that are performed here can be learned, in fact I would even say that you can enjoy them as you tumble.

IV. Biographical Excursions

1. Childhood and Youth

The world of Vienna

B. P. Fichte taught us the sentence, "The kind of a philosophy one has depends on what kind of person one is." One could add to this the following: "The kind of person one is depends on where one comes from." You were born in Vienna in 1911. What was your childhood like?

H. F. I grew up in an amusing and stimulating atmosphere. Turn-of-the-century Vienna was a meeting point for artists, creative people, painters, and masters of architecture. Gustav Klimt and Egon Schiele lived there. My parents and grandparents were part of this lively milieu. My great-grandfather was an architect and starting in 1880 his plans were used to reconstruct the entire city of Vienna. He set up the *Ringstrasse* and the *Gürtel* as two concentric circles around the center of the city. The streets were designed to run, star-like, from the center to the outskirts of the city. My grandfather also worked as an architect. He constructed the buildings on the *Ringstrasse* and erected countless buildings that imitated the style of the Gothic period and the Renaissance.

B. P. What did your father do?

H. F. He was a brilliant draftsman and possessed a fantastic capacity to imagine things three-dimensionally. He wanted more than anything to become an architect, but my grandfather didn't allow him to. He told him that it was absolutely out of the question, since he had already built everything that there was to be built in the

Austro-Hungarian monarchy and there wasn't anything else for him to do. Unfortunately, my father was forced to become an electrical engineer.

Fig. 7 *"For the anniversary of the 150th birthday of Heinrich von Kleist, Haybach publishers in Vienna put out a special edition of the novella Michael Kohlhaas in a large format. They engaged Erwin Lang to illustrate the story using several wood cuts. Lang found the model for the headstrong squire Wenzel von Tronka in his brother-in-law, my father, Emil von Foerster. Here you can see him, as the model, stuck in a suit of armor."*

B. P. How would you characterize your mother's side of the family?

H. F. My grandmother, Marie Lang, was one of the first women in Europe to fight for women's rights. She founded an international magazine entitled *Dokumente der Frauen* [Documents of Women]. Why did she do that? Her involvement in the cause of the liberation of women goes back to her school days. While she was still in school, her beloved teacher suddenly stopped coming to class. No one wanted to talk about what was wrong with her. Everyone kept beating around the bush and gave all kinds of wishy washy answers.

Finally my grandmother, who was still a young, energetic girl, demanded an answer from the teacher's husband, whom she had run into by chance. He told her that his wife was no longer allowed to teach school because she was expecting a baby. And it turned out to be correct. There was a law that forced a teacher to leave her post if she became pregnant. The reasoning was that the children might be tempted to ask about the source of the teacher's new shape. My grandmother decided then and there to get rid of this law once and for all. And lo and behold, shortly after the end of the First World War, when she was over sixty, she managed to have this law abolished under the Social Democratic government in Austria.

Fig. 8 *"My mother's brother, Erwin Lang, became a painter and a graphic artist. He created this wood cut for his mother's 72nd birthday. She was my grandmother, Marie Lang."*

B. P. What impact did your grandmother have on you?

H. F. She was very important for me. When my father was being held as a prisoner of war by the Serbs right at the outset of the First

World War, I was taken to her quite often. She established a type of salon in her house, where once a week artists, singers, journalists, and philosophers from all over the world came together. While the adults carried on their conversations, I sat under the table (I had a little place with toys down there) and above me they all debated with each other, quarreled, and laughed. A nice *abschnitzel* of these encounters is a wonderful cookbook that my grandmother gave my sister Erika for her 10th birthday. My grandmother was quite old then. What kind of cookbook was it? When the ladies got together to debate about important political issues it was inevitable that they would make remarks about the exquisite little things that my grandmother served. The focus of the discussion shifted to cooking and the ladies exchanged recipes. My grandmother, who was a woman of great discipline, wrote down these recipes, recorded the name of the person, as well as the type of occasion and date on which the suggestion was made. She wrote this all down on little pieces of paper and kept them in a box. When my grandmother became very old, she spent the final years of her life at a fantastic estate owned by her eldest son. And one day she got all the little pieces of paper out, put them in order, and categorized them into appetizers, soups, meat dishes, etc., and listed the name of the person and the occasion. It says, for example, that Eleonore Duse gave my grandmother a recipe for a wonderful risotto – in exchange for a recipe for *Salzburger Nockerln*. The cookbook ends with a complete index of dishes and all the authors of the recipes, from market vendors to celebrities. It's a historical and culinary work that is one of a kind.

Let's go on to my mother. She was highly talented at drawing and painting and attended an art academy in Vienna with Oskar Kokoschka. My mother also had a very open home. During the get-togethers that took place at our house, I sat under the piano – a huge grand piano – so I could listen in on all the adults' conversations. My mother was wild about mountain-climbing, and often spent the summer in the Dolomites. I went on my first hikes in this region, when I was 12 or 13 years old. And I played in a jazz combo with two friends of mine. I often played the saxophone until 6 in the morning then dashed home and took a cold shower so that I could get up at 8 o'clock and try to manage to keep my eyes open during school.

Fig. 9 *"This picture shows my mother Lilith in a photo taken by photographer von Damaschka, a well-known fashion photographer at the time. As I already mentioned, my father was taken prisoner right at the outset of the First World War. One of the many prison camps in which the withdrawing Serbian army held its prisoners was a castle that they had seized. One day my father was looking through a pile of old magazines that was lying around on the floor there. He pulled out a copy of Elegante Welt and discovered this picture of his wife on the cover."*

B. P. You once wrote that you actually grew up "in a matriarchy".

H. F. Yes, I think you could put it that way. I spent the early years of my childhood among women. Just think of my aunt, Grete Wiesenthal, who was a famous dancer at the time. She was married to my uncle, Erwin Lang. He sketched and designed her costumes. Like my father, he was taken prisoner at the beginning of the First World War. And that is how my mother began to work for Grete Wiesenthal as a kind of *costumière*. There weren't any babysitters in those days, so when I was between the ages of four and six I was always taken along to the theater. I sat in the dressing rooms of the beautiful ladies, watched them as they performed their elf-like steps on the stage, followed them back into their dressing rooms, and witnessed the constant transformation and rebirth of their beauty in the dance. That was wonderful and simply fabulous. I adored those women who spoiled me, the little lad in the dressing room.

B. P. So philosopher Ludwig Wittgenstein entered your life from one side of your family.

H. F. He was an honorary uncle, a *Nennonkel,* as they say in Vienna, not a relative, but a very good friend. My mother and his sister Margarethe, were good friends. Margarethe was a very nice rich young woman who was considered to be a bit extravagant. Sometimes my mother took me along when she visited her. There was

Fig. 10 *"This is a woodcut of the marvelous dancer Grete Wiesenthal. It was done in 1912. She was the wife of my Uncle Erwin and the mother of my dear cousin Martin, my companion throughout most of my youth."*

always the most exquisite chocolate, and once "Uncle Ludwig" joined us. I must have been about nine years old and had just managed to pass the entrance exam for the secondary school in Vienna, despite the fact that I had gotten the worst grades of all the pupils at my elementary school in Vienna. Uncle Ludwig asked, "What do you want to be when you grow up?" I answered, "I want to be a *Naturforscher* – a nature researcher." For me, that meant a rather romantic cross between Fridtjof Nansen and Marie Curie. And Ludwig Wittgenstein said, "But you have to know so much!" I had just passed this exam, so I said, "But I *do* know a lot." And then he looked at me, smiled slightly and said, "But you don't know how right you are." That sentence still haunts me today.

B. P. What do you think Wittgenstein meant by that?

H. F. Perhaps he meant that children have so many skills and possibilities that they are not aware of. They can talk and walk, dance and sing, but one thing is not clear to them. They don't know that they know. Be that as it may, I encountered Wittgenstein again through his book *Tractatus logico-philosophicus*. My family was appalled that at this point in my life I was absolutely carried away by his book and knew passages by heart that went on for pages. Every time some topic came up and I was unhappy about how it was being dealt with I'd quote Wittgenstein: "Look, in Proposition 5, point 21, Wittgenstein says something completely different. In the *Tractatus* it says ..." They all shook their heads and lamented, "What can we do to help this young man?"

B. P. I can imagine that Wittgenstein's *Tractatus* impressed you most from the point of view of form and style, since you yourself like using very precise formulations and the seemingly innocent aphorism. Yet as far as content goes, it seems to me that there isn't much reason for you to be so enthusiastic about his book. After all, at this point Wittgenstein still took a realistic stance, basing his perspective on the theory that language represents the structure of the world. For Wittgenstein, perception is not a construction.

H. F. That's right. I imagine that my predilection for formulations that are short and to the point goes back to my early encounter with

the *Tractatus* and the aphoristic propositions. This method of presenting things had quite an impact on me, you're right. But I don't agree with your theory that there isn't or never was any reason for me to be enthusiastic about the book from the point of view of *content* because every text allows for different approaches. Just take the assumption that the world is represented in language and interpret this statement as an axiom that can be turned around. If you do this, you'll get the sentence, "The world is a representation of language." And when Wittgenstein talks about the world and the consequences that the world has for our perception, I talk about the consequences of perception and see the world as a consequence of our speaking and action.

Experiences of a magician

B. P. In those days of your childhood and youth, can you think of any key experiences that led you to begin seeing reality, meaning the sum of our perceptions, as a construction?

H. F. Before I go into the specifics, I'd like to mention the fact that Grete Wiesenthal and Erwin Lang had a son, and his name was Martin. We were absolutely inseparable. And one day we began to take an interest in magic and started making up our own tricks.

B. P. I don't quite understand. What do the tricks that are performed by a magician have to do with epistemology?

H. F. Even as a child it was clear to me that the essence of magic is not the false bottoms, optical illusions, and the other things in the magician's bag of tricks. Magic is what happens when the magician manages to invent a fantastic world. The magician knows how this world has evolved and has come to be.

B. P. I just don't understand the connection between doing magic and your conception of knowledge. After all, in epistemological terms the magician is actually a naive realist. The magician's sleight of hand presupposes a *real reality*. Magicians only create illusions and they know that they aren't real. Rabbits disappear and women are sawed in half. Magicians produce something that is unreal and manage to get people to conjure up the wild idea that it is real.

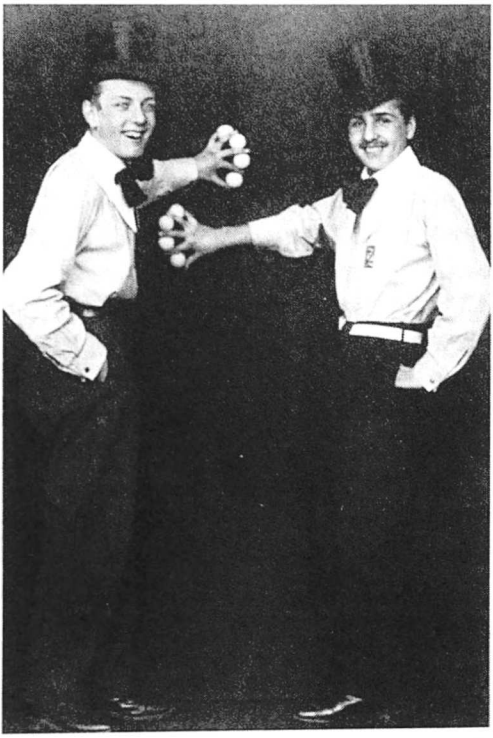


Fig. 11 *"In this picture, you can see the trick called 'The Chicago Billiard Balls' performed by Heinz and Martin. In this trick the balls fly through the air from one hand to the other – now you see them, now you don't."*

H. F. Well, that's the assumption of a person who doesn't know how magic works and who is desperate for an explanation. I'm already uncomfortable with the word "only". Why do you want to disparage something by saying it's *only* a trick, or *only* an illusion? The language that you are using at the moment is already laced with presuppositions of realism. People think that they know exactly what is real and what is unreal. Of course you always believe that the magician has hidden something and kept it under wraps. But in fact it's completely the other way around. Good magicians don't hide anything; in fact, they make things as obvious as possible. They work very slowly. They manage to kidnap the audience from their everyday world and take them to a magical world where miracles still exist and are visible.

B. P. Would it be correct to say that your epistemology isn't actually a theory but rather an experience or a practice? If I am correctly informed, you were in fact a successful magician and were even a member of an association of magicians and artistes.

H. F. That's right. My cousin Martin and I were always upset about the adults we performed magic for. They often had a condescending attitude toward our magic tricks, in which we showed a great deal of dexterity. "Oh look how nicely the boys are doing their tricks." This arrogance drove us mad and we wanted to show those adults how clever we were. At the time there was an international organization of variety performers and you were only admitted if you passed a very strict entrance exam. To do this, several people were chosen to attempt the exam and as potential members we had to give a performance in front of acrobats, magicians, and highly experienced artistes in Vienna's Apollo Theater. We had a total of three minutes to impress the jury, which we managed to do. Of course, it's a bit difficult to examine a magician. It isn't like in school, where when you are quizzed it's pretty cut and dry. Either you know it – without using a crib sheet – or you're caught with one and get a bad grade. But how do you want to go about examining a magician?

B. P. You might put it this way, that a magician can only be good or bad within a relationship to another person. Magicians need a relationship with the audience. Their quality is measured according to the response of the audience.

H. F. That's correct. Doing magic always includes an element of dialog. You invent a world together. I already saw the role that the audience's expectations play in this when I attended a vaudeville show in Paris. It was called Crazy Horse. I saw the most fantastic magician that I have ever encountered. He got up in front of his audience and put two pedestals on the stage. The one pedestal was empty and the other one had a vase with a couple of flowers on it. He then put a cover on each pedestal so that you could no longer see the flowers. Everyone knew what was going to happen. The flowers would be magically transferred from one pedestal to the other. But that's not what happened. The magician did his conjuring bit ("Hocus, pocus ...", etc.) and picked up the cover on the

empty pedestal. And there weren't any flowers. Not even the vase! Then he took the cover away that had hidden the flowers. And you could see the flowers again. It was a miracle!

B. P. So he played with the expectations of the audience.

H. F. He did that with one trick after the other. It was unbelievable. The knots in silk scarves didn't become unknotted. Instead, they reappeared with the knots still in them. Rabbits didn't disappear, but remained visible. This man made it clear to me that it has always been one's own expectation that determines the success of a trick. An atmosphere is created in which the audience expects a miracle to take place, and they contribute a great deal to determining whether this miracle can be created and whether this is possible – this may happen consciously or unconsciously. An evening of magic that has been a success is in fact a successful encounter. We create a world together.

2. The Second World War and the Post-war Period

Survival in Berlin, the capital of the Reich

B. P. Upon graduating from high school you studied physics in Vienna. What did you do after you finished your degree? Where did you work?

H. F. I worked as a physicist for a company in Cologne that developed and sold vacuum pumps. One day I had to fill in for a regular salesperson at short notice. I did well with the customers and this led to the company using me as a kind of trouble shooter. They called me every time they had some kind of problem. After a while this job began getting to me. "You are a physicist," I said to myself. I decided to quit and went back to Vienna. That's where I met my future wife one New Year's Eve. She was the actress Mai Stürmer. We were married in November of 1939 and then ended up going to Berlin. I had gotten an offer to work there in a research laboratory of a big company.

B. P. At that point, Hitler had already invaded Austria, and the Second World War had broken out.

H. F. Right. My wife and I felt that we would only be able to survive in Berlin. Everyone in Vienna would have known that I had a Jewish grandfather. But nobody knew my family in Berlin. We loved the city and its people. Their sauciness, wit, and dry humor allowed them to put a certain distance between them and the dictatorship and the whole three-ring circus of an Adolf Hitler.

B. P. How did you manage to find work and survive in Berlin, the center of National Socialist power and the capital of the Reich?

H. F. I lied and filled out the so-called Aryan ID the wrong way. My idea was, "Let them be the ones to figure out that something isn't quite kosher. It's not my problem." A Nazi functionary came from time to time and told me I had to send my Aryan ID from Vienna, which was needed to confirm that everything was okay. Of course, I answered, "I'll take care of it right away." And then I used this buddy-buddy kind of tone to tell them about the proverbial slowness of the authorities in Vienna. My supervisor in the lab had probably figured that there was something fishy about my Aryan ID. But he never gave even the slightest hint that this was the case and today, looking back, I think that he probably protected me on occasion. This is how we were able to survive without being discovered or recognized. At some point the frequency of the visits decreased and with all the hub-bub of the war around us they were just too busy to verify the Aryan ID of a certain Heinz von Foerster.

B. P. You speak about this time using an easy gesture that makes it look as though you are almost wiping it away. This prompts me to ask about the other part, the terror of these years and the threat to your family.

H. F. That was obviously hanging over our heads, like the sword of Damocles. Of course there were times when we were in real danger. For instance, we were friends with a Jewish family, two elderly women and a man, and they couldn't go out in public any more. They wore their badge with the Star of David on it. My wife and I

shopped for them and brought them things to eat. I always put what I had bought in front of their door. And one day, when I stopped by with the shopping, the door was open and there was no one there. The Gestapo had just rounded them up.

B. P. You once wrote that during this period, performing magic kept you from "physical and mental injury".

H. F. It's important to keep in mind that at the time, the two of us and our two older sons lived right downtown next to the *Gedächtniskirche*, the huge Berlin church that now stands in ruins as a monument to the destruction of war. We had a fantastic apartment that my wife had been clever enough to find. This apartment was particularly well-suited as a meeting place. Friends visited us at night and we discussed the situation – and the bell would always be ringing. Before anyone could enter they asked the question, "Can we speak?" That was the password that we had agreed upon to make sure that the person at the door wasn't an informer. With this type of pressure in mind, we developed a sort of sixth sense and that included having a feel for a wide variety of nonverbal signals that let us know whether or not we could trust a person who came to us. During these nights of discussion and debate, I often performed magic tricks and greeted our guests as follows: "Ladies and gentlemen, I am now about to present you with a few small experiments of modern parlor magic."

B. P. So you conveyed yourself and your guests to a better world.

H. F. Yes. Together we amused ourselves with these little stories, jokes, and magic tricks. This is how we were able to free ourselves from the pressure of what was going on around us and our day-to-day fears. Laughing and entertaining each other was so incredibly important during this time when you always had to be afraid that somebody would knock on the door and take you away.

B. P. What was your experience of the bombing of Berlin at the end of the war?

H. F. When Berlin was evacuated from 1941 to 1942, we went along to Silesia, since my company was relocated to this area. I worked there doing basic research near Liegnitz. We stayed until just before the invasion by the Russians. Then I had to avoid being called to the so-called *Volkssturm*, which mobilized civilians to support the army in a last-ditch effort to defend the country and cost many of them their lives. My wife managed to get to Mannheim with our children, far from Berlin, taking lots of detours along the way. I rode my bike to Berlin through snow that was many feet deep, riding along the tank tracks. There I lost all of our worldly possessions that I had carried around in a backpack. When the war was over, we no longer owned a single thing. We had lost everything. In the end, I picked up my wife and the children and we returned to Austria. We were in Kufstein, an absolutely picturesque town in the Tyrol, when the war ended. I will never forget that moment. We were all sitting on a bench outside. The snow was still gleaming from the mountains and the sun was shining. We observed the battle between the U.S. Rainbow Division and the last tanks of the SS that were slowly withdrawing. When the Americans occupied Kufstein soon after that they appointed me the mayor of Oberndorf, a village to the west of Kufstein. That was my one venture into politics, which ended up coming to a close very rapidly. After one or two weeks we all moved back to Vienna.

As "Dr. Heinrich" on the radio

B. P. During the postwar period, a number of writers and philosophers openly discussed their opinions about the Nazi ideology and published studies about totalitarianism. Did you also have the desire to air your views about this?

H. F. Yes, I did. And it turned out to be quite easy to fulfill this desire. The thing is that I actually had two jobs after the war. I worked for a telephone company and as a journalist. The U.S. military had just established a radio station that they called *Rot Weiss Rot*. Using the name "Dr. Heinrich", I was made the head of the department of arts and science. It was against the law to do two jobs at one time, and the telephone company and the radio station were not very happy about my respective obligations, since they had each hired me to do a full-time job. But at the time I had the extraordi-

Fig. 12 *"After many attempts I was finally able to air the weekly radio broadcast 'That's debatable' on the American radio station Rot Weiss Rot. The range of topics was determined by the people's miserable circumstances. After losing the 'total war' they were occupied by foreign powers and were materially and emotionally crushed. These same people were searching for guidelines, foundations, and a set of ethics that would help them to rebuild their lives. Topics that 'were debatable' included 'collective guilt', 'the current spiritual crisis', and 'law, laws, and justice'."*

nary privilege of owning a motorcycle, and I would race back and forth from the phone company's board meetings and my desk at the radio station. So, what's the point of telling you all this? The point is that the job at the radio allowed me the opportunity to talk about the period of National Socialism. The terror of the concentration camps had just come out. In Vienna there were huge posters all over the place that showed naked, broken bodies, corpses from the concentration camps. It said on the posters, "It's all your fault!" During these months I established a special radio program that turned out to be hugely popular. It was called "That's debatable". People were invited who were involved in some aspect of the questions of guilt and innocence. Diego Götz, a Dominican friar, and Margarethe Bauer-Clumberg, who was extremely sensitive, talked and discussed different questions. From her I learned that nuances are the most important things. And that made sense. If the nuances are correct, it

is possible to say something that is correct. Psychiatrist Viktor Frankl is also someone who contributed a lot to the program. He had particular authority because he was a survivor of the camps.

Collective guilt or individual responsibility

B. P. Despite his horrific experiences in the concentration camp, Viktor Frankl always completely rejected and criticized the idea of collective guilt.

H. F. I completely agree with him. I'm not familiar with any "collective". Where is it? You can't shake hands with a collective, you can't put your arms around it or sit across the table from it and ask how it is, if it hurts anywhere or why it laughs or cries. This is a notion that prevents a direct relationship between one person and another person.

B. P. Does it bother you that the notion of the collective abstracts from the individual?

H. F. Human beings are free and are not the victim of a collective or any other kind of external violence. They appear to me to be a universe for themselves. The way I see it, people who parrot something and put themselves at the mercy of another person still remain individuals who have made a decision to parrot something and to put themselves at the mercy of another person. My friend Humberto Maturana, who was threatened by the dictatorial regime in Chile, once said, "Power is the consequence, submission is the cause." That means that when you refuse to play a role in a collective and to submit yourself to it, there is no power on earth that can defeat you.

B. P. But it is a fact that during Nazism many people allowed themselves to participate in the game of submission and no longer appeared as individuals but instead only as an element of a marching collective. They didn't wake up until they stood, horrified, before the mass graves.

H. F. Now, these people decided to surrender their individuality or to stand in the background, and that is the crucial point. All I can

say from my perspective is that it's not my problem, since I am constantly pleading for us to see the enormous range of choices for action – and I don't deny that that is a very idealistic standpoint. The idea of the collective shrouds these choices and hides them from sight. You believe in a static being of the human and purport to have finally found him or her when you talk about him or her in this way. That is the ontological view of people in which they appear as *human beings*. For me, the human is full of choices. He or she is not a *human being*, but rather a *human becoming*. That is an ontogenetic view that has to do with the becoming and emerging of the being. Seen from this point of view, humans can make something of themselves and can cause their individuality to blossom. Thus, humans are inadequately described if you characterize them as members of some collective.

3. A Jump to another World: America

Theory of memory

B. P. You left Vienna in 1949 and began a career in science in the U.S. A book brought you to North America. It was entitled *Das Gedächtnis: Eine quantenmechanische Untersuchung* [Memory: A Quantum Physical Study]. In this book you developed a theory of learning and forgetting that fascinated the earliest cyberneticians, including Norbert Wiener, Warren McCulloch, and others. But first things first. How did this study come about?

H. F. Keep in mind that I was always an extremely poor pupil. This is because I just couldn't remember the isolated facts and dates that we were taught in our history lessons. It never did gel. What was the thing about that Cleopatra? Was it Julius Caesar or Abraham Lincoln that was her lover?

B. P. So the trouble you had remembering dates led you to the question of the way the memory works?

H. F. Not exactly, but it was this trouble that gave me the impetus to craft a table that shows the years of human history in set intervals along a timeline. And one thing became clear: Lincoln and Cleopatra

could have never been a couple. But I saw something else: The further back you go in history, the fewer dates you have to put on the timeline. The further back in history the events are, the greater the likelihood that they will have been forgotten. That means that dividing up a table of history in intervals of equal length results in an unnecessary waste of space and paper. In the section of a century that has just passed there are all kinds of dates, but in a century that is long past there are hardly any dates at all. This observation inspired me to embark on the search for a time scale that gets shorter and shorter and shrinks more and more the farther you go back in history.

B. P. So you wanted to use a table to represent the way one remembers history, one that becomes more and more imprecise over the course of time.

H. F. Exactly. I managed to do this with the aid of a logarithmic function in which each decimal power (1, 10, 100, 1000, etc.) has the same length. That means that if we have our table begin with the recent past I will have a lot of space at the beginning of the table for dates and events and this space will become smaller and smaller in relation to the amount of dates and events that I can fill in as I go back in the past.

B. P. How do you get from a logarithmically organized table of history to a cybernetic theory of memory?

H. F. The next thing that occurred to me was that we forget in a logarithmic manner as well – at least that was my theory. And one day, many years later, I had the chance to test this hypothesis. After the war, by pure coincidence, I discovered the book written by a certain Hubert Rohracher. It was called *Introduction to Psychology* and I had bought it for just a few shillings. This book contained the so-called Ebbinghaus forgetting curve, which I of course tried to explain with my mathematical equations.

B. P. What was the result?

H. F. Nothing worked out, not one single thing. My theory appeared to have been destroyed But then at some point I figured out that in

order to develop this curve of forgetting, Ebbinghaus had had his subjects memorize nonsense syllables – *wu, mi, ka, schno* – in order to test how many of these syllables could be retained in set time intervals. And suddenly it occurred to me that using this method, he did not just determine the actual act of forgetting, because the act of recalling something means that it must be relearned and anchored in the memory. That means that the differential equation that describes pure forgetting needs to be extended by a learning function. The result of adding this function was that my theory, which after all, I had written up and published, was correct again. In February of 1949 I traveled to America on the *Queen Mary* and took with me a couple of copies of the little book that contained the theory. And after making its way through the circle of friends and other interested readers, it reached the great neurophilosopher Warren McCulloch, who had just returned from a conference about memory.

B. P. I assume that when Warren McCulloch read the book and was fascinated by it, it was not just because he read it from the point of view of someone who was interested in the theory of memory but also from the perspective of a cybernetician. After all, in the dual movement and reciprocity of learning and forgetting that you expressed mathematically a cybernetic mechanism is manifested. What is said is relearned and is more difficult to forget. The output has an effect on the input and this becomes new input. And then everything starts all over again.

Beginnings of Cybernetics: The Macy Conferences

H. F. Exactly. This element of circular causality was the reason that McCulloch was interested in my book. He invited me to come see him and I took one of those cheap night flights to Chicago, where I met him at the university. He did not speak a word of German and my English was limited to 25 words at the most. But we used the universal language of mathematical formulas that allows something like a conversation to take place. It was McCulloch who introduced me to the circle of cyberneticians who came together at the invitation of the Macy Foundation.

B. P. In those days, the elite of American science met there at the invitation of this foundation.

H. F. That's right. They included the great anthropologists Margaret Mead and Gregory Bateson, the incredible mathematician Norbert Wiener, who had already done his doctorate at the age of 16 or 17 at Harvard, then John von Neumann, who was the inventor of the computer and of game theory, the renowned physiologist Heinrich Klüver, and many others. Not long after my first encounter with Warren McCulloch I held a lecture in front of this group of American scientists. The lecture consisted of little more than my few words and numerous mathematical formalisms. Luckily there were a few German emigrants who attended the conference as well, and they helped me. The atmosphere was friendly and there was an intensive and fearless creativity. Everyone helped me and tried to translate my stammering attempts to present my ideas and no one worried about impressions or protocol. After the lecture I had to leave the lecture hall for a moment because I only had guest status. When I was called in again I was addressed with the following words: "What you had to say was extremely interesting, but the way you expressed it was a disaster. In order to help you learn English as quickly as possible we hereby declare you the editor of the reports of our conference." I immediately pointed out that I wasn't even capable of pronouncing the name of the Macy Conference. It was entitled "Circular Causal and Feedback Mechanisms in Biological and Social Systems." For this reason I proposed that we name the conference for Norbert Wiener's book, that had just appeared two months before. The title was *Cybernetics*. – After all, the principle of circular causality manifests itself in the notion of cybernetics. At least, that was my view at the time. When I said that, everyone applauded, and Norbert Wiener was so touched that he had to leave the room for a moment to hide the tears. A scientist of this caliber touched by the fact that his fellow human beings acknowledged his work. I found that absolutely astounding.

B. P. It seems to me that you experienced this journey away from Vienna and Europe, that had been devastated by war, as a type of liberation or as a jump into another world in which what counts is not following protocol, but in which the ideas are the foundation and the impetus for an encounter. When I sat down to prepare for this conversation, the thought kept coming up that this joyful experience of success is what shapes your epistemological position and

Fig. 13 Participants in the Macy Conferences.
First row: T. C. Schneirla, Y. Bar-Hillel, Margaret Mead, Warren McCulloch, Jan Drooglever-Fortuyn, Yuen Ren Chao, W. Grey-Walter, Vahe E. Amassian.
Second row: Leonard J. Savage, Janet Freed Lynch, Gerhardt von Bonin, Lawrence S. Kubie, Lawrence K. Frank, Henry Quastler, Donald G. Marquis, Heinrich Kluver, F. S. C. Northrop
Third row: Peggy Kubie, Henry Brosin, Gregory Bateson, Frank Fremont-Smith, John R. Dowman, G. E. Hutchinson, Hans Lukas Teuber, Julian H. Bigelow, Claude Shannon, Walter Pitts, Heinz von Foerster
"This picture shows the participants in the last of the ten conferences on 'Cybernetics. Circular Causal and Feedback Mechanisms in Biological and Social Systems'. It took place from April 22–24, 1953. Several of the science greats of the middle of the century were in attendance. If you wanted to measure the literary creativity of these people according to the volume of their writings you would have to count more than 3,000 publications. At this particular conference two science greats were missing. They were Norbert Wiener, who had redefined the notion of cybernetics in 1948, and John von Neumann, the father of the huge computer revolution, which even after a half a century comes up with something new every day and has yet to show any signs of fatigue. If you took all the biographies of these participants it would make a fascinating book that could be entitled A Turning Point in Epistemology. *I guess I'll leave the writing of this book to the next generation."*

what inspired you to constantly and vehemently fight against the stagnation of thinking and the domination of rules ("form") and labels.

H. F. Definitely. These experiences of "friends in need" were extremely important for me. They equipped me with a very basic sense of security. And something else that goes along with this: In Austria

and in Vienna, the city where I have my roots, in particular, "form" is so absolutely important. In the U.S., these formalities, such as whether or not I wear a tie or speak English perfectly, were completely meaningless for the elite group of American thinkers who met at the Macy Conferences.

B. P. The conferences were very important for the development of cybernetics. And you became a member of a group of scientists that could be referred to as the "Cybernetic Circle". How would you describe the atmosphere in this Cybernetic Circle? How did you discuss things? What were the topics?

H. F. What particularly impressed me was the enthusiasm and the euphoria with which the participants discussed things and thought yet unfinished things through together. The dynamics were creative and emphasized the aspect of creating connections. We constantly asked about contexts and possibilities for developing a concept or an idea. No one would have put up with the tedious academic ritual of discrediting other understandings or notions. What I liked the best was the fact that these people didn't just talk about cybernetics, but that they also talked with each other. It was a celebration of understanding and a give and take that always honored the integrity of the other person. Warren McCulloch, who liked to refer to himself as the "Experimental Epistemologist", was the initiator of this style of thinking. Anthropologist Margaret Mead, who became famous for her books *Coming of Age in Samoa* and *Sex and Temperament* kept an eye on the discipline of the participants in the discussions. When the vanity of the speakers began to take over, she would nicely interrupt, saying, "We know that you can do Greek, but let's stick to the subject, shall we?" Gregory Bateson was married to Margaret Mead at the time and he enriched many debates with his wisdom. W. Grey-Walter was there as well and he constructed mechanical turtles that crept along the floor any which way – without bumping into anything. The volume of questions that were debated in this atmosphere was extraordinary. The topics included the construction of sensory prostheses, the communication among animals, the growth of giant shells in freshwater shrimp, worries, humor and laughter, the principle of circular causality, teleological mechanisms, etc. We always attempted to better comprehend the foundations of living organisms.

B. P. The scientists who gathered there were all interested in interdisciplinary research.

H. F. There was definitely a style of thinking that transcends the limits of a single discipline. A style of thinking doesn't have anything to do with subject matter or content. It has to do with the manner in which discussion or debate takes place. It was a form of togetherness and enthusiasm for exchange of ideas that distinguished the Cybernetic Circle. You could discuss all kinds of different questions and topics that touched on areas that included logic, physics, mathematics and psychology.

B. P. Interdisciplinarity, a chief feature of the conferences, may be one of the connecting constellations of your life or a type of "red thread", as one would put it in German, of your intellectual biography.

H. F. I don't know if I would call it interdisciplinarity. Being part of a discipline requires one to understand and to know the research activity of a certain area or certain subject. Interdisciplinarity means that you have to understand at least one other area or subject. But this word also makes it seem as though encounters across the borders of the subject are something extraordinary and sensational. It still conveys the idea of being bound to a discipline.

B. P. What word would you use, then?

H. F. I would probably use the word "non-disciplinarity", or – and this is especially offensive for Germans – "lack of discipline". That simply means that you shouldn't allow yourself to be disciplined by someone else. It's correct, there is a dialog-oriented style of thinking or a principle that is oriented toward what we share. It's a refusal to regard the borders of a subject as insurmountable. This dialog-oriented principle also contains the questions as to what connects a physicist and a psychiatrist, a mathematician and a biologist, and a person who speaks about the liver and one who speaks about the sun. The different nature of the approach is never a reason for breaking off the conversation but instead is the basis for mutual fascination. What I particularly liked was the fact that the people in

the Cybernetic Circle saw each other as brothers and sisters in spirit, despite their different backgrounds. We did our reflection in an atmosphere of cooperation.

The Biological Computer Laboratory

B. P. You founded the Biological Computer Laboratory at the University of Illinois in 1957. It was a sort of small *non-disciplinary* republic of scholars. Early on, research reports were published that continue to set the tone for the discussion on epistemological and cybernetic questions today. Could you describe the atmosphere at the Biological Computer Laboratory?

H. F. When I established the Biological Computer Laboratory I of course saw to it that no one discipline could dominate any other discipline. Since I am actually a physicist and mathematician and wanted to get to know other subjects and fields, I asked for a sabbatical and left the University of Illinois for two semesters. During the first half I worked at the Massachusetts Institute of Technology (MIT) with Warren McCulloch and Norbert Wiener, and during the second half I was in Mexico with physiologist Arturo Rosenblueth because I wanted to get to know my way around the field of neurobiology. I did experiments with him in his laboratory. That was fascinating and extraordinarily instructive. After this year, I asked the university for permission to set up the Biological Computer Laboratory. They agreed and I began to invite a wide variety of people to come to us so that I could work with them.

B. P. Who came to the Biological Computer Laboratory? What were your most significant topics?

H. F. We looked at logic and epistemology, language recognition, and communication and the questions we dealt with were those that are currently being debated in the context of Artificial Intelligence. Philosopher Lars Löfgren worked here on the concept of a self-referential logic that he referred to as *autologic*. Warren McCulloch held lectures. Neurobiologists Humberto Maturana and Francisco Varela addressed problems of cognition and wrote seminal publications on the notion of autopoiesis, which has become so well-known today. John Lilly, who did research on dolphins, visited us on many

occasions and spoke about his attempts to communicate with these animals and to teach them English or to learn their language from them. He studied the way dolphins made sounds, the structure of phonemes and their sense of hearing. An Israeli dancer taught us notation for forms of movement. And we brought forth a number of inventions. For example, we built the world's first parallel computer. You can use it to do things such as determining and calculating the number of red blood cells in a blood sample at lightening speed.

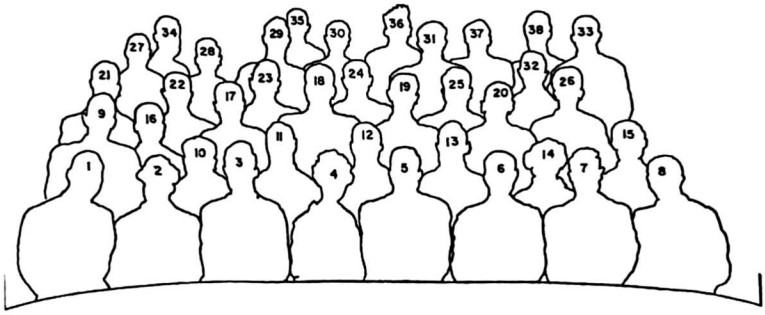
B. P. The Biological Computer Laboratory appears to have been an avant-garde institution from the point of view of the fact that you didn't pay any attention to the strict separation between natural sciences and the humanities. Traditionally, and in the wake of the work by Charles P. Snow, it has become convenient to speak of two cultures and an unbridgeable gap between the natural sciences and the humanities. It seems as though the enmity between the literary intellectuals who have no idea what electricity is and the scientific authors who have never heard of Shakespeare has never been a factor for you.

H. F. No, not at all. For me, science is an activity that creates knowledge and that is applied to both the natural sciences and the humanities. In my opinion, the separation that you just mentioned is an artificial one, since what it important is the creative processes that cannot be distinguished according to terminology. In German, the word "science" is present in the words for the "natural sciences" and the "humanities" and they are only separated by a prefix, yet this prefix should not be used to divide the two.

B. P. Well then, how would you distinguish between the different paths that are used to create knowledge?

H. F. Perhaps it would be a good idea to distinguish between *science* and *systemics*. These are two ways of thinking, two forms of perception, and two styles of thinking. The Indo-European root of *scientia* is *ski*, which contains meanings such as "separate", "divide", or "distinguish". That is the Western tradition of thinking and it is based on reductionism and the belief in causality. You design taxonomies, keep breaking down a problem until it appears to be pos-

Fig. 14 Participants in the conference entitled "Principles of Self-organization", that took place in 1960 at the invitation of Heinz von Foerster at the University of Illinois. 1. Saul Amarel, 2 Gordon Pask, 3 Manuel Blum, 4 Kathy Forbes, 5 Peter Greene, 6 Ross Ashby, 7 Jack Cowan, 8 Heinz von Foerster, 9 Alfred Inselberg, 10 Ludwig von Bertalanffy, 11 Scott Cameron, 12 Murray Babcock, 13 John Tooley, 14 Cornelia Schaeffer, 15 Stephen Sherwood, 16 George Jacobi, 17 Hans Oestreicher, 18 John Bowman, 19 Jack Steele, 20 Friedrich von Hayek, 21 Hewitt Crane, 22 Anatol Rapoport, 23 Raymond Beurle, 24 Jerome Elkind, 25 John Platt, 26 Charles Rosen, 27 Roger Sperry, 28 Frank Rosenblatt, 29 Joseph Hawkins, 30 Albert Novikoff, 31 Stafford Beer, 32 Paul Weston, 33 David Willis, 34 George Zopf, 35 Albert Mullin, 36 Warren McCulloch, 37 Marshall Yovits, 38 Leo Verbeck



"Warren McCulloch, Stafford Beer, the British wunderkind of cybernetics in management, and Marshall Yovits of the Office of Naval Research made particularly significant contributions to our understanding of self-organization. Yovits was in charge of this and similar conferences. We lovingly referred to Gordon Pask as 'Mr. Self-organizing System'. Cornelia Schaeffer functioned as the catalyst of this conference. Anatol Rapoport was the leading mind of 'operational philosophy'. The three intellectual giants, Ludwig von Bertalanffy, Ross Ashby, and Friedrich von Hayek, were also very important. Ludwig von Bertalanffy was the precursor of theoretical biology because he was the first person to develop the thermodynamics of energetically open systems in order to do justice to the metabolism of organic forms. Ross Ashby, a psychiatrist, became the father of European cybernetics. Friedrich von Hayek was an economist and received the Nobel Prize."

sible to deal with it, distinguish the effect from the cause and hope to find the rule of transformation that allows the effect to become a cause. The other way, which is creating knowledge, is what I call *systemics*. Those who use this way of thinking do not divide and separate but instead try to connect, unite, and compare. In this way of thinking, the most important thing is connection, the art of making connections and even making connections to oneself, which according to conventional logical is highly dangerous. *Science* and *systemics*, the two ways, the two styles of thinking, can actually complement each other. A good scientist who knows how to make a distinction will always ask him or herself, "What have I cut up, what have I separated?"

B. P. At the Biological Computer Laboratory, researchers saw the borders between the various disciplines as too inflexible, and so you always went about destroying them. The emphasis was on making connections and practicing *systemics*. A former student reported that commitment to integration was not always so well appreciated within the university.

H. F. Oh, that's for sure. There were a number of people who just couldn't understand at all what we were getting at. For instance, there was the time that we asked Ross Ashby to join us. He was a psychiatrist who had written an introduction to cybernetics that had become very well known. And when the vice president heard through the grapevine that he was coming, he asked, "Has it gotten so bad that they now need a psychiatrist?" Now to be honest, sometimes it quite surprises me that they never threw me out of the place. Perhaps one reason for them putting up with me is that the univer-

sity also profited from me quite a bit. I pulled in several million dollars worth of research grants and was probably quite a cash cow.

B. P. I understand that in the late 60s financial difficulties arose that ultimately meant the end of the Biological Computer Laboratory. Up until that time the Laboratory had been funded by the Office of Naval Research and the Air Force Office of Scientific Research. In 1968 a law was passed that prohibited projects from being funded that did not directly benefit the military.

H. F. That's correct. The law was passed, and we would have had to change our focus of research in order to get on the military's good side, and that was something I wasn't willing to do. But there were actually several other reasons for the demise of the institute. The topics that we were working on made it increasingly difficult to get funding. And many of the top researchers who had joined us left the laboratory. Humberto Maturana returned to Chile, Francisco Varela began working in Paris, and Ross Ashby became very ill. Plus, it became clear that I would have to retire at the age of 65 – in 1976. And so I dedicated the final years of my research activities as a university professor to dismantling the Biological Computer Laboratory, making sure that my Ph.D. students finished up, and giving away our equipment and instruments. In the end, my wife and I left Illinois in 1976 and settled on Rattlesnake Hill in Pescadero, California. We bought a fantastic piece of property that was covered with poison oak. Luckily, I'm one of the small percentage of people who are immune to poison oak, which normally causes horrible oozing, itching rashes. This meant that I could go in there with a machete. One of our sons, who is an architect, helped us to build a house. We laid a road, drilled a well, and got rid of the poison oak. If you climb the hill here, you can hear the roar of the ocean ever so slightly and if you look to the West and to the East, there is a fantastic view into the valley below. Deer come right up to our front door. It is just absolutely beautiful.

B. P. What is your life like these days?

H. F. In the morning, before the sun's rays become too strong, I try to work on our property. I cut up trees that have fallen during a

storm, pick apricots, work with my mower, and try to keep everything from turning into a jungle again – not easy in this fantastic climate. In the afternoon I rest a bit. My wife and I go for a walk, climb the hill, and enjoy the view. And during the evening and into the night I write my little Foersterabilia and prepare the lectures that people from all over the world invite me to hold. But as soon as I can, I return to Rattlesnake Hill.

V. Knowledge and Ethics

Ethics is not a Theory

B. P. The two books that you have published recently are called *Wissen und Gewissen* [Knowledge and Conscience] and *KybernEthik* [CybernEthics]. Even the titles allude to a context that has been present in all of your work and which has been the topic of our conversations at various points, even if it has been more indirect than direct. This topic is the indissoluble connection between epistemology and ethics. How can this connection be described? Or to put it more precisely, what epistemological position has what ethical consequence?

H. F. I would like to make it clear that I am not so much a pronounced epistemologist as a person who acts according to his own conscience. And the notion of epistemology as knowledge *theory* is something I don't like at all, because if you interpret it very strictly following the tenets of Karl Popper, it always points you in the direction of falsification. You actually have to start doing experiments in order to disprove your own theories. That means that you have to look for counter-examples in order to determine whether or not you have gone overboard with your assumptions. Falsification is the first thing that you need to do when you come up with a theory. And falsification is one of those tasks of academic clubs. It is a kind of intellectual activity that has to satisfy certain rules. I don't mean to say that this isn't worth as much, but when I use the word theory I'm simply talking about another area. I would prefer to call it an ethical attitude rather than a theory. An attitude is much more holistic. It is comprehensive and it determines my behavior toward the

entire world, influencing the way I act toward my neighbor's dog, other people, and toward the flowers.

B. P. So you decide on an attitude or an ethical practice. You choose it.

H. F. No, I don't think so. It's not something conscious but rather more of a preliminary decision. You stop reflecting about things and just do them automatically. For example, if you see an elderly woman, and she drops a coin on the ground, your own attitude makes you bend down and pick it up for her. But what do you do when it is a young man who drops a coin? Do you also bend down and pick it up? Even though he is young and has enough energy to pick it up himself? Do you make a fool out of yourself if you bend down and pick it up? That to me is a question of attitude. I have already made the decision that no matter who drops a coin I am going to pick it up.

B. P. Does that mean that for you epistemological reflection is secondary and concrete action or the particular deed is primary?

H. F. The point is that you can't discuss ethical questions while you are relaxing in your easy chair. They arise in a concrete situation rather than being abstract and being able to be discussed out of context. Of course I was also an epistemologist and was on the staff of a university, but if you ask me about an ethical dimension, then it is a matter of practice, of down-to-earth problems and not a matter of those categories and taxonomies that serve to fascinate the academic clubs and their specialists.

B. P. Well, let's not use the notion of epistemology theory, but rather a concrete thesis. The American Society for Cybernetics once quoted you as having written the following: "Objectivity is a subject's delusion that observing can be done without him. Invoking objectivity is abrogating responsibility, hence its popularity." How does the rejection of responsibility relate to the postulate of objectivity?

H. F. For those who work in science and put forward mathematical theories and work in laboratories, the following questions are very significant: What is an observation? How does it come about?

How can one be sure that this or that is the case and that this or that view of things is universally valid? Starting from the problems of classical empiricism, during the nineteenth century, a certain Hermann von Helmholtz developed a strategy that he assumed might be able to produce observations that were universally valid. Helmholtz decided to place the observer on the so-called *locus observandi*. From here observation would be completely neutral, free from any personal influence, individual taste, or the particular characteristics of a person who examines and studies something.

B. P. Your description of the *locus observandi* sounds somewhat like an epistemological Switzerland, a place with complete epistemological neutrality.

H. F. Excellent. That's exactly what it was supposed to be, an epistemological Switzerland. It is incredibly attractive to think like this and to sell one's own assumptions as something objective. But if you take a closer look and ask what you mean by the notion of objectivity, you realize that one of the characteristics of objective description is that it does not contain the observer's individual properties because they would influence and determine the outcome. So what does that mean? Shouldn't you use your own eyes, listen, smell, or taste? I have never quite been able to figure out what the advocates of the postulate of objectivity even think they can observe when they forbid a person to have his or her personal view of things. What is an observer supposed to perceive when he or she is required to be deaf, dumb, and blind and is forbidden to use his or her language, which in fact is what the definition of objectivity would require? What can the observer communicate to us and how can he or she communicate in the first place? It seems to me that it is always an observer who does the observation. He or she is the crucial element of the observation.

B. P. But what do these thoughts about the notion of objectivity have to do with abandoning responsibility, a practical consequence?

H. F. If I say a statement is objective, this claim is based on the idea that one doesn't have anything to do with the statement. You are just making a description, functioning as a sort of camera, passively

registering what is going on. From a political point of view, separating the observer from what is being observed is an oft-played game. After all, how can you blame objective observers for anything? They are just reporters, not participants in what is happening. Better still, they can refer to the fact that they are only representing *objectively*, which is actually the case.

B. P. The way I see it, you can describe the connection between objectivity and responsible action in exactly the opposite way. Pointing out the objective truth that has been recognized is often the basis for responsible involvement. The fact that something is objectively the way it is, for instance, because the destruction of nature is *really* continuing, we have to do something about it. And if you put it the other way around, refusing to accept the idea of a reality that can be objectively known could be interpreted as the justification for indifference. There is no longer anything that is *really* important, one might say.

H. G. Of course. Even the beautiful poem by Goethe entitled "The Wayfarer's Night Song" can be interpreted in a hundred thousand different ways. You can also interpret Jesus' words, "If anyone strikes you on the right cheek, turn to him the other also" can also be interpreted as a challenge for some people to hit other people on the cheek. Because, you could put it this way, after people get used to you turning the other cheek, they will be encouraged to hit your cheeks and won't be afraid that they will be punished. My point is this: Everything can be interpreted in a wide variety of ways. It's the so-called hermeneutic fundamental principle or the hermeneutics of the listener. It is the listener and not the speaker who determines what a statement means.

B. P. But this interpretation, which sees the rejection of objective knowledge as a possible justification for an indifferent attitude can't be one that you like.

H. G. No, I don't like it at all. But I would actually like to recommend the opposite interpretation. My understanding is the following: As soon as you start making the connections to the outer world and talk about the evil of the world, the suffering is gone because it

has been pushed to the external world. Objectivists push it aside. People with non-objectivist attitudes, however, are involved in a completely different manner. They say, "I see all this evil in the world." This type of statement suddenly turns a person into a fellow sufferer. The result is involvement and not the indifference that you were afraid would be the result. Perhaps I can go back to the little skit that I talked about at the outset of our conversations. There's this man who says, "There's a tree over there!" Then the woman says, "How do you know that there is a tree over there?" The man answers, "Because I see it!" Then the woman says, "Aha." And the curtain drops. Now we need to ask ourselves which of the two attitudes we want to accept for ourselves. The man makes these external connections and the woman points out that the perception of this tree is connected to *his* observation. But be careful. In this skit it is not just about the contrast between objectivity and subjectivity, or about different epistemological positions. There is something that is far more important than the conflict between the objectivist and the subjectivist and that is the fact that the man separates himself from the world and the woman connects herself to what she is describing.

B. P. Actually there is another point of contrast that has entered the game. It is not about objectivity or subjectivity and the respective consequences arising from these epistemological positions. What is much more important is the fundamental question as to whether I connect myself to the world, the events, and what happens to myself and others, or whether my epistemological position forces me to see myself as separate from the world, as a person who goes about observing from an imaginary *locus observandi.*

H. F. Yes, you have described that very well. *Reality, objectivity, ontology*. These are all static notions that can be used by people to separate themselves from the world. They can be used as a justification for your own indifference by saying that there is nothing you can do about it, since it is always a matter of an immutable existence that is rigid and timeless. The man in the skit looks at the universe that is passing over him and evolving, at the trees, the objects and the people, as though he is looking through a keyhole. He does not need to feel responsible. You could say he represents a keyhole or peephole

philosophy. Nothing bothers him. He remains untouched by everything. Indifference is excusable. It's the Pontius Pilate phenomenon. You say that you don't have anything to do with whatever has happened and wash your own hands of the guilt. The woman points out that it is always a human being who sees and contemplates things. This means that you can contrast two fundamentally different positions. The attitude of uninvolved observers contrasts with the attitude of people who empathize and are involved and who see themselves as part of the world. Their basic assumption is, "Whatever I do will change the world." They are connected to the world and its fate and are responsible for their action. With this kind of perspective, the world can never become the enemy. It appears as an organ, as a part of their own body that is inseparable. The universe and the self become as one. The notion of the struggle for survival that is laden with fear turns into harmonious coexistence.

Decidable and Undecidable Questions

B. P. What kind of arguments are this attitude of connectedness and ethics in general based on? There have been times when you have been accused of using biology to justify your thoughts on ethics and in so doing falling prey to the naturalistic fallacy, since you go from "what is" to "what should be" and mix description and prescription together. People accuse you of using the following pattern of argumentation: Using the point of view of the perception of biology, we cannot know the world objectively. Thus, the objectivists are wrong and this is why we all need to assume the position of connectedness.

H. M. I would recommend that anyone who thinks that this is the way I think read one of my papers if they get a chance. I'm sorry, but there is no place in my lectures or my books that refers to either "what is" or to "what should be" that has evolved from it. In fact, I claim that there is no way that it can be decided which of the two attitudes is more correct or true. The way I see it, it cannot be decided whether we are connected with the world or are separated from the world. And that's why I am the one and only person who can decide which of the attitudes I think is the right one.

B. P. What are decidable questions?

H. F. A decidable question is always decided within a framework that determines the possible and right answer from the outset. Its decidablity is guaranteed by certain rules and formalisms, although they have to be accepted. Syllogisms, syntax, and arithmetic are all examples of these types of formalisms. Within the framework of a logical-mathematical network you get from one junction (the question or the problem) to the next junction (the answer or the solution). This is what makes the question of whether or not the number 2546 can be divided by 2 so easy to answer within seconds, since we all know that numbers that have a final digit that is even can be divided by 2.

B. P. What are undecidable questions?

H. F. Those are questions that have to do with such things as the existence of higher beings, the meaning of life, the origin of the world, and life after death. They all contain a variety of possible answers. For example, you could ask how the universe came to be. How could that be decided? If you ask a physicist you get the following answer: "Everybody knows the answer to that! Ten or twenty billion years ago there was the Big Bang and that gave rise to our universe today. Today, if you use a gigantic microwave antenna, you can still hear a slight rushing sound that is actually the echo of the Big Bang." But then ask a good Catholic, and they'll give you a detailed description of the creation story. If you ask an Indian Hindu the same question, he or she will tell you, "Any child knows that first there were some turtles, and some other turtles climbed on top of these turtles and then more turtles climbed on those turtles and finally, a turtle climbed on top and that's where we are sitting in the universe, on top of that turtle on the top!" And so you can go from person to person, and ask the Turkmen, the Arapesh, and the Eskimos, and you'll keep on getting another story of how the universe came to be. How are you supposed to figure out who is right? This question cannot be decided, but trying to answer it is an opportunity to find out something about the person answering the question. To put it in a nutshell, it's like saying, *Tell me something about the origin of the universe and I'll tell you who you are.* When someone tells

me about the turtles, a bell goes off: Aha, a Hindu! If the next person tells me about the Big Bang, I can tell who the person is: Aha, I bet you're a physicist!

B. P. Do you think you could say that an undecidable question is something like an evocatory mystery? It evokes the characteristics of our thinking and makes our world view crystal clear.

H. F. I wouldn't call it a mystery, since a mystery is only a mystery if it possesses an answer that may reveal itself at some point. You don't know something *yet*. But the undecidable questions that I was talking about are unsolvable by their very nature. So I won't try to find some kind of new label for it. No, I think we should continue to refer to these phenomena as undecidable questions, since talking about undecidability is meant to be an invitation to make a decision. You are being called on to make the choice. In a certain sense decidable questions have already been decided by the framework in which they exist. The only thing you can do is to follow the rules in order to find the answer. According to my metaphysical postulate, however, only questions that are decidable by their very nature are ones that can be decided by *us*.

B. P. What do you mean by the term "metaphysics"?

H. F. This is what I think: We are always metaphysicists, whether we refer to ourselves in this way or not, when we decide questions that are in principle undecidable. And I think that we are constantly doing this in the flow of existence. We decide undecidable questions over and over again, questions that cannot be clarified one way or the other (due to their logical structure, because there is no way to make an observation, etc.). Even when you speak about the past, you choose one possible version of an event. You don't know how it was. You just know what you can recall about it.

B. P. Do you think that we are always only talking about our construction when we talk about the past?

H. F. Yes, I do. Every story and every event in the past can be written from very different perspectives. How do you think you can

know what the right or correct version of an event is? The past cannot be reconstructed. It can only be observed *by us* using language. *What was is gone.* It's quite funny to compare the history books that are used at the different schools in the U.S. Depending on whether they are written for elementary, high school, or college students, every description of what appears to be the same event is different. Of course, the people, in this case the authors of the books, are not always aware of the fact that they have made a decision about what is supposed to have happened. But we should be aware of the fact that we are constantly making decisions of this sort. I would even go so far as to say that the question is undecidable as to whether an experiment can be found that unequivocally determines if a question is undecidable or not. The problem of undecidability cannot even be decided on the level of the second order.

B. P. How can we go back to the attitude of connectedness with the world that we were talking about earlier?

H. F. I can only repeat what I said before. I claim that we cannot clearly answer the question as to whether we are separated from or connected to the world. If you are able to invent an experiment that would make this question decidable or not, then drop me a line. But I do think that this is impossible. We can only decide to take on one of these two attitudes and take on the responsibility for our decision ourselves.

B. P. Well, that was a very elegant solution to the problem of justifying your ethical position. You decide on the position of connectedness with the world and this decision is the reason justifying it, the foundation. That means that in this case the foundation behind the ethics *itself* is an ethical decision.

H. F. That's the idea, exactly. And at the point at which I have decided an undecidable question, responsibility comes into play. You decide to view the objects, the world, and your fellow human beings in a certain way and to act accordingly. You become responsible for the decision that you made and that no one else can take away from you.

B. P. Don't you think that the idea that every individual is connected to the fate of the world is an enormous burden? How can you feel responsible for suffering in completely different places in the world?

H. F. Of course there are all kinds of horrible things happening at any given time in the world, but there are also many heroic deeds that take place, some big and some small. They usually go unnoticed, but we should in fact pay more attention to them. The horror that we experience when we see the killing in many places in the world can perhaps be offset to some extent by paying attention to the many good deeds that are happening at the same time. The fact of the matter is that you simply can't do everything and you can't help everyone. We only have a limited amount of energy. But perhaps you can make a difference in your own particular situation. That's about all a person can do. You can only act in the world that you have at your disposal.

B. P. But these days, when we talk about "the world", we no longer mean our immediate surroundings. In our mentality and our perception it has become globalized. When we speak about "the world", we don't mean the village where we were born, or our own neighborhood or the city where we live today, but rather the planet, the earth. We see that we are contributing to the destruction of the earth by using an airplane and by adapting the fast-paced lifestyle that we have become accustomed to. That means that against the backdrop of global destruction this idea of connectedness can drive one to despair.

H. F. Keep in mind that is also possible to see this connectedness from a point of view that does not necessarily make one despair. You can allow yourself to be destroyed by the dimensions of the horror, that is absolutely correct. But you can also try to save yourself and hold yourself up by focusing on the vast goodness that can be discovered all over the world. I don't think I can give you a more precise or a different answer right off the cuff. I should find a poetic form to express what I would like to say.

B. P. If you take this idea of connectedness with our fellow human beings and the other parts of this line of thinking and try to localize it in current discourse, it appears to be especially prevalent in the New Age scene. It seems to me that a sort of *Network Theology* is emerging at the moment. A Talmi religion is developing from spirituality and science that intends to lay down a new respect for connectedness.

H. F. That's the guru problem and the attempt of some people to give up their responsibility again by completely and utterly submitting to some doctrine or a certain person. It means the end of the doubt that we were just talking about and the end of reflecting on one's own path. Of course it is more comfortable to hang onto the coattails of a guru or a leader or some great idea. You can stop thinking and can submit yourself completely to a world. By the way, my doctrine is not to have a doctrine. Of course that is a paradox, but it is a very dynamic one. During one of my lectures I once said, "Ladies and gentlemen, please, don't believe a word of what I am about to tell you!" Everyone laughed and apparently believed that they shouldn't believe what I had said. But I meant what I had said.

B. P. What language or form can be used to prevent a thought or idea from becoming a doctrine of salvation?

H. F. In this context I have always suggested making a distinction between ethics and morals. The way I see it, morals are explicit and ethics should remain implicit and should be interwoven in the actions of an individual. I think that morals are a matter of an authoritarian appeal, a sermon, or a regulation. You tell somebody else how he or she has to behave, you shove a doctrine down their throat and create a system of compulsion in order to increase your own power. I'd like to go back to the *Tractatus*, in which Ludwig Wittgenstein writes: "When an ethical law of the form, 'Thou shalt ...', is laid down, one's first thought is, 'And what if I do not do it?'" The words "Thou shalt" immediately evoke the idea of punishment. When ethics meet up with morals or moralizing, then the idea of defending a cause turns into a strategy of submission. In my opinion, it should always be a matter of "I shall", because it is only my own actions

which are available to me, not those of others. I think it is absurd to advertise the idea of connectedness as an ethical law.

B. P. It is obviously no coincidence that the New Age movement is interested in this idea. After all, this feeling of connectedness with the world is also an idea that can be encountered in the portrayal of mystical experiences. You merge with the world, the cosmos, and the universe.

H. F. Well, for me these mystical experiences are not mystical at all. I am constantly living with them and trying to make the people around me aware of these types of experiences that are actually part of their everyday lives. We should wake up and take note of these enigmas and wonders of the world that are continuously emerging, but that we constantly gloss over without even seeing them. Of course the so-called mystics, for whom everyday life is nothing that is amazing or wonderful will have to compromise in order to qualify the amazing features of mere existence as something special and react by saying, "Oh my God, I have just had a mystical experience! I just had a vision!" I think it is astounding that many people seem to take so long to see that the world is always full of wonder, during every minute of the day.

B. P. Do you ever have the *experience* of connectedness in your life? This might be a bit off the subject, but author Kurt Maix once wrote about a mountain-climbing expedition that he went on with you. And anyone who has ever gone mountain climbing knows that you climb along a rope that is tied to the other person. The idea of climbing along the rope seems to be a concrete example of the idea of connectedness.

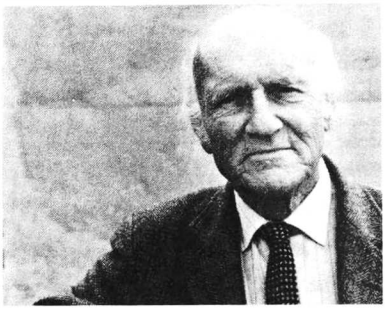
H. F. That's not off the subject at all. The idea of following along the rope gives rise to an incredible feeling of togetherness and it's an excellent example. You pound a carabiner in the rock and thread the rope through that connects the two people. And there is an experience with Kurt Maix that he wrote about – perhaps you've heard about it. One time we were mountain-climbing in the Torstein South Wall with his girlfriend and an old mountain climbing veteran. The Torstein South Wall consists of 1600 meters of slippery and steep

rock. Kurt Maix, who was leading us, had an accident that very morning. He had attempted to climb over a spot that was very difficult and very slippery and he had slipped and fallen down below. The first and the second hook that Maix had pounded into the wall were pulled out but, thank God, the last hook remained embedded. The rope that had connected him to his girlfriend had saved him. I had to climb over this nearly impossible spot in order to help him and remove the rope. The interesting thing was that I was able to go back and forth across this spot several times. My attention was so focused on this other person, who was dangling from the rope, swaying back and forth with a head injury, that I forgot that it was actually impossible to climb there. It took the entire day to remove him from the rope and carry him down on a stretcher.

B. P. If I continue with this image of climbing along the rope together, you could say that this is a wonderful metaphor for an idea of connectedness that you have just used. You take turns holding each other to keep each other from falling.

H. F. It is a most beautiful metaphor. But many people fail to see this connection. Instead, they cut through the rope, and plunge into the abyss. But climbing along the rope together means that we are utterly and completely one person. There is no separation. We are connected with the world and the other person, who will not allow us to fall. Whatever happens to you happens to me. And whatever happens to me happens to you. And in so doing, someone gives you their life, and you give them yours.

About the Authors



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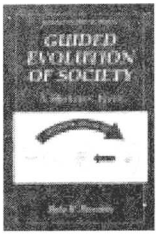
Heinz von Foerster was born in 1911 and is known as the "Socrates of cybernetic thought". After studying physics in Vienna, he was employed by various research laboratories in Germany and Austria. At the close of the Second World War, he worked for a short time as a journalist and consultant for a telephone company. During this period he wrote his first book, *Das Gedächtnis: Eine quantenmechanische Untersuchung* [Memory: A Quantum Physical Study]. In this book, he developed a theory of memory that attracted the attention of the pioneers of American cybernetics. Von Foerster was invited to join them and emigrated to the U.S. in 1949. There he was welcomed into a circle of scientists who came together regularly at the invitation of the Macy Foundation during the 1950s. He was appointed to be the editor of the annual conference reports. Mathematician Norbert Wiener, whose book *Cybernetics* had just been published, John von Neumann, the inventor of the computer, anthropologists Gregory Bateson and Margaret Mead, as well as neuropsychiatrist Warren McCulloch, along with more than a dozen other leading researchers were the members of this group of intellectual enthusiasts that met together in the so-called Macy Conferences. Here cybernetic thought took on its shape.

In 1957 Heinz von Foerster established the Biological Computer Laboratory (BCL) at the University of Illinois, where he had a professorship until his retirement in 1976. The BCL served as a venue for meetings of avant garde thinkers from all over the world. Philosophers, electrotechnologists and biologists (including Humberto R. Maturana and Francisco J. Varela), anthropologists and mathematicians, artists and logicians met in the BCL's inspiring atmosphere to discuss epistemological questions from the perspectives of natural science and the humanities. They dealt with the laws of computational processes in people and machines and analyzed the logical and methodological problems that inevitably arise when one wants to know knowledge, understand understanding and observe the observer. Von Foerster is credited with ceaselessly pointing out the unavoidable biases and blind spots on the part of the observers, who approach the object of description that they perceive to be independent of themselves. According to von Foerster, we need to always be aware of our own blind spots. In addition, we should perceive conclusive finite statements in a serious sense as our own products and question certainties in every shape and form, always searching for new and different ways of thinking.

Bernhard Poerksen studied German language and literature, journalism and biology at the University of Hamburg and Pennsylvania State University. He works as a journalist for numerous newspapers and teaches media and communication studies at the University of Hamburg. Poerksen is the author of a study on the language of Neonazis entitled *Die Konstruktion von Feindbildern* [The Construction of the Images of the Enemy]. His recent publications include the book *Die Gewissheit der Ungewissheit – Gespräche zum Konstruktivismus* [The Certainty of Uncertainty – Dialogs on Constructivism].

Guided Evolution of Society
A Systems View

by **Bela H. Banathy**



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